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JANUARY 1961

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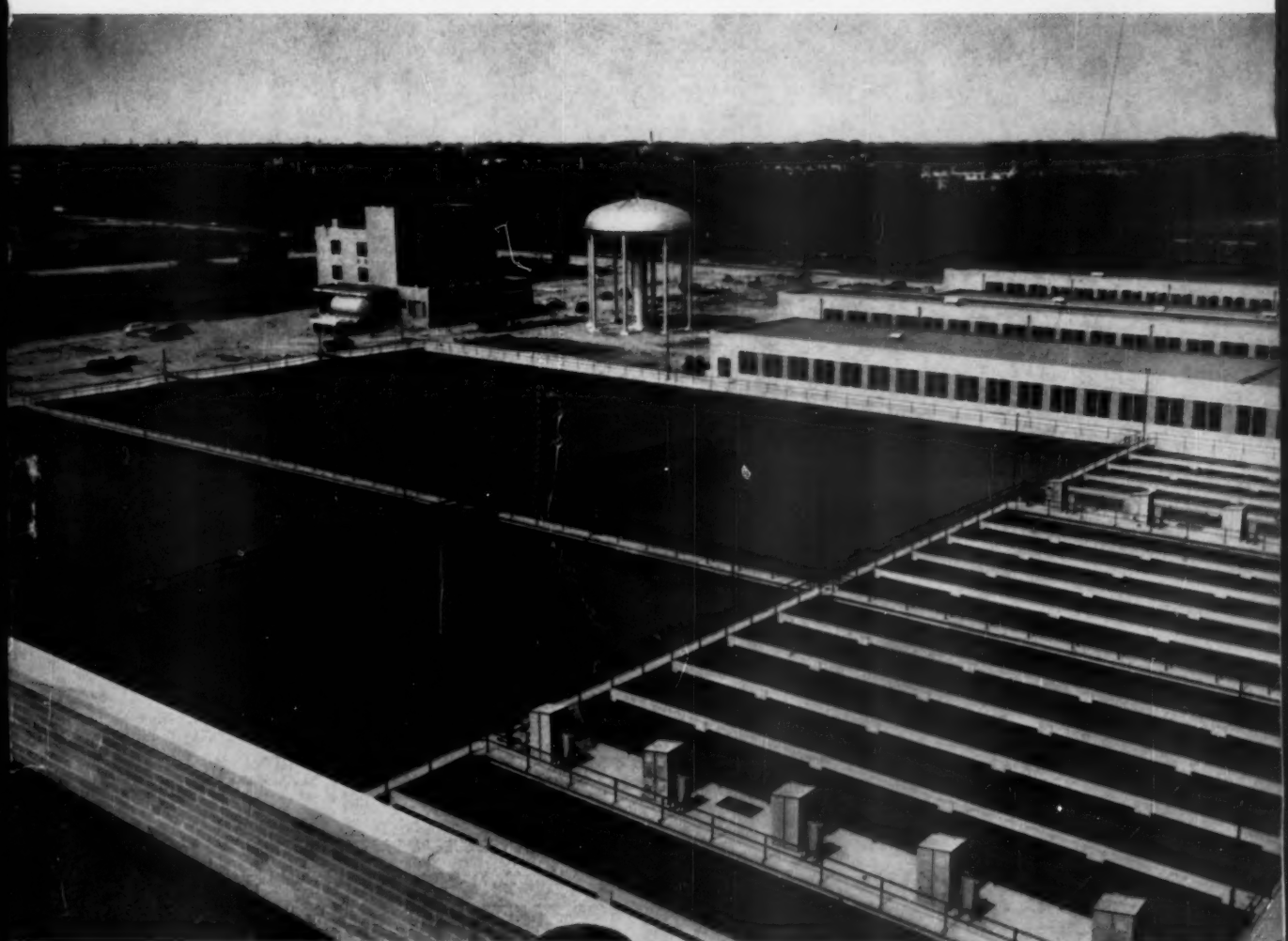
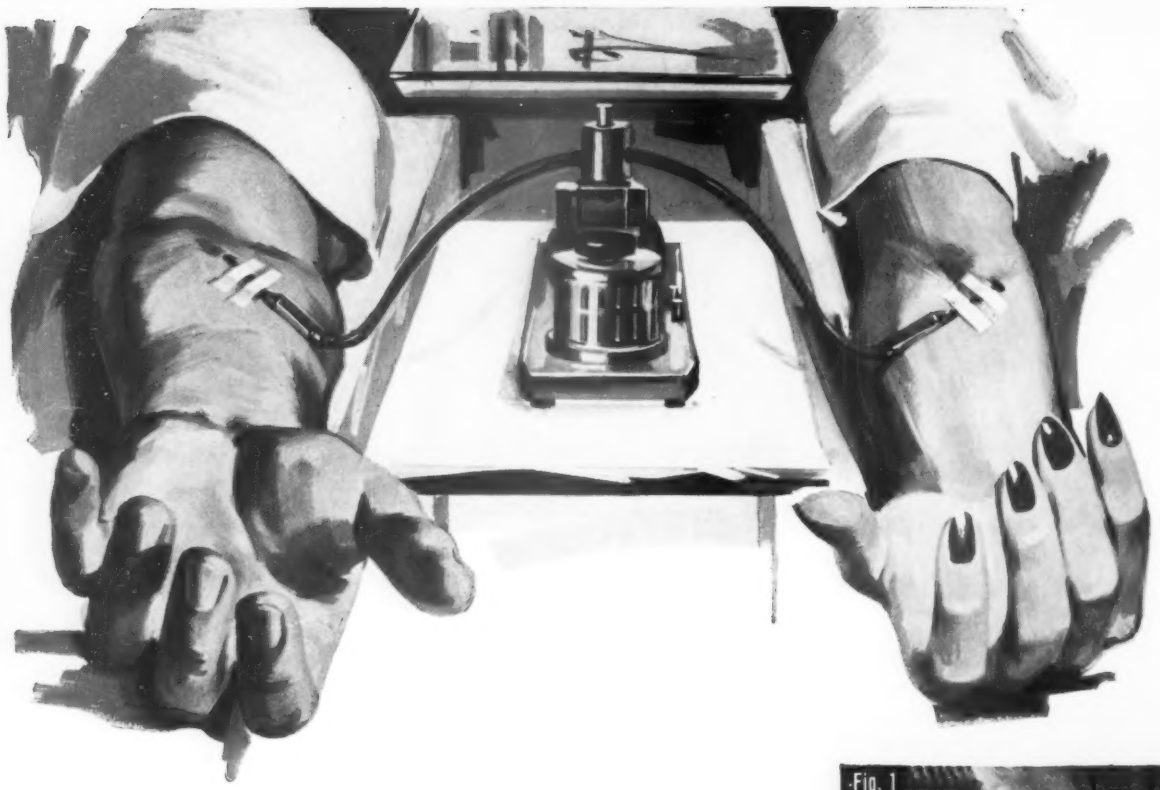


Annual Photo Equipment Review Issue



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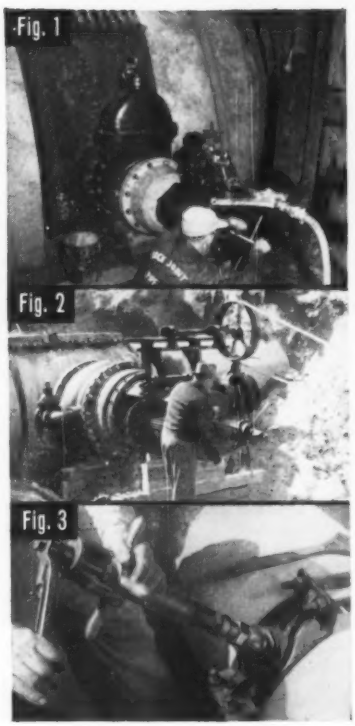

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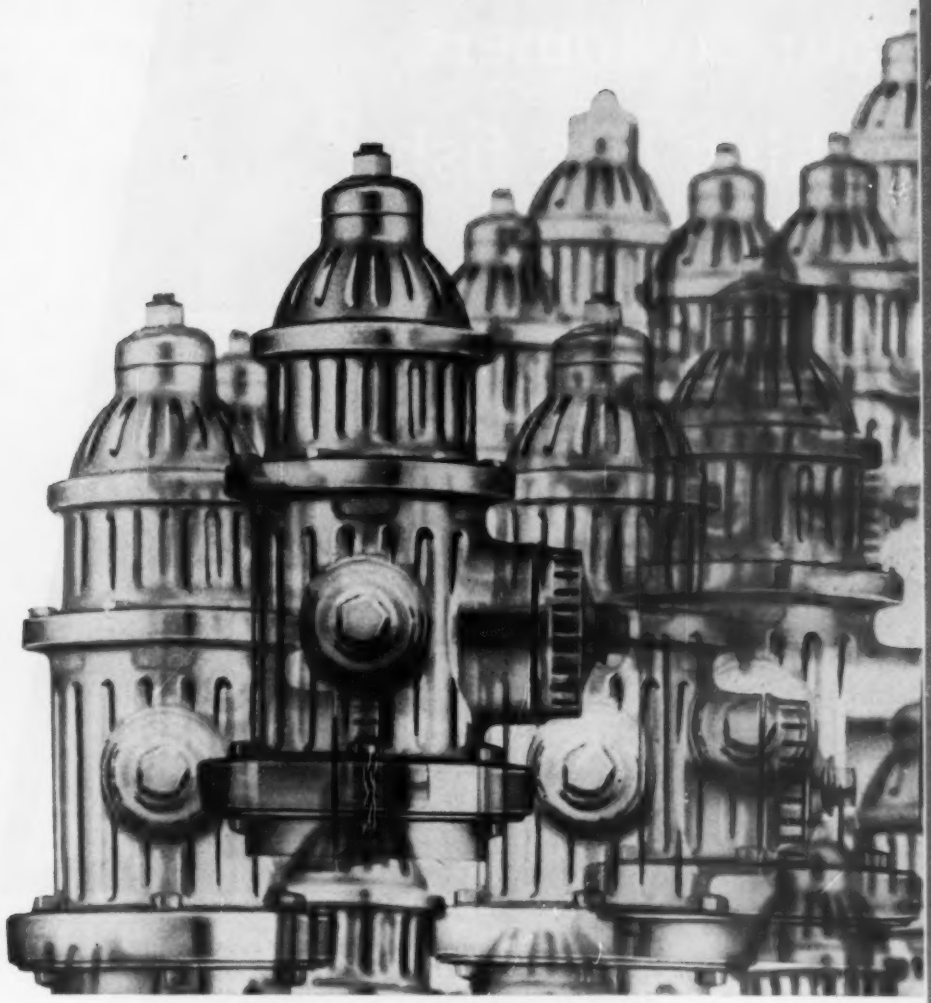

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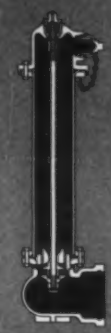

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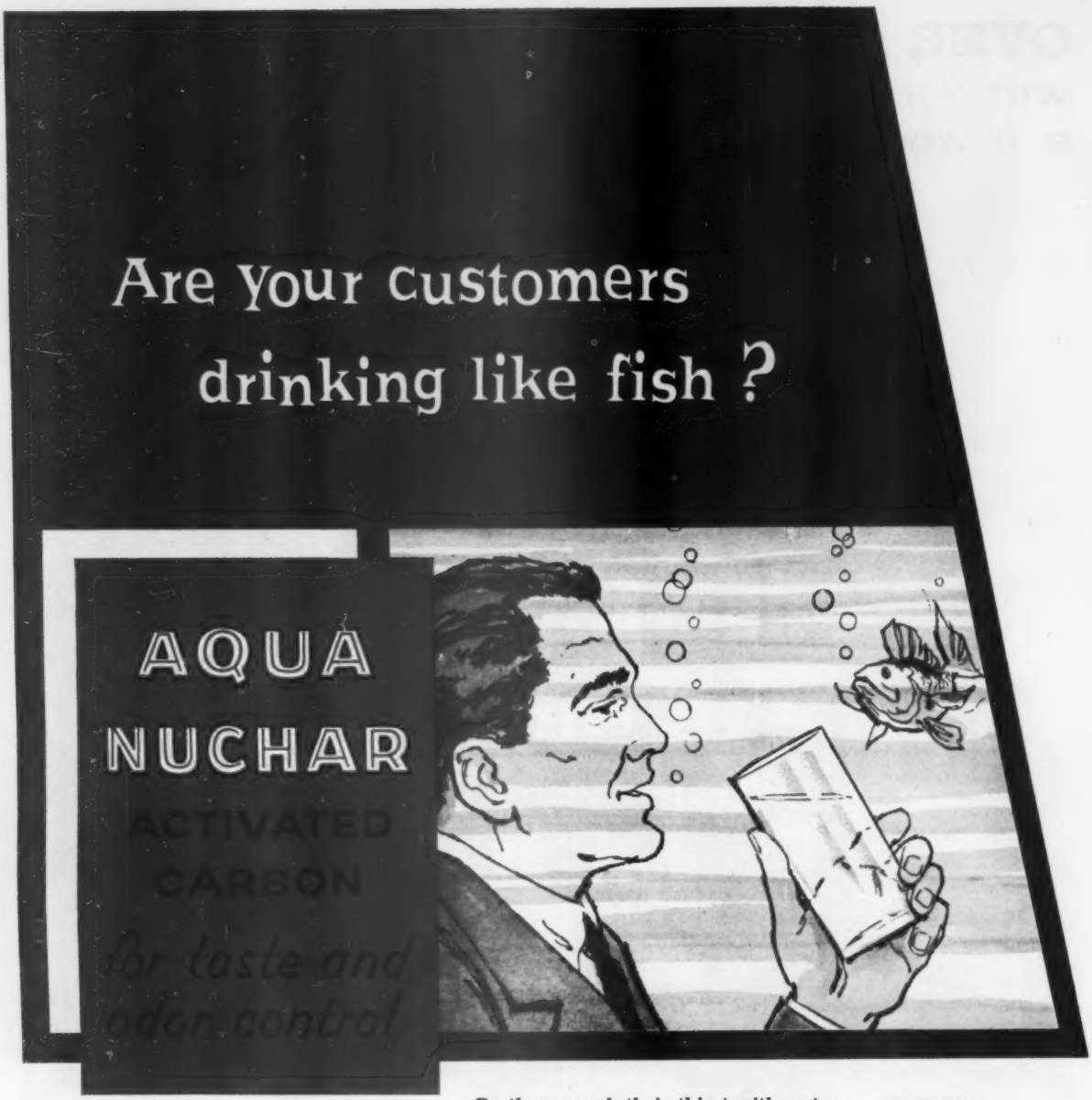

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WATER & SEWAGE WORKS

VOL. 108 NO. 1

JANUARY 1961

A Scranton Gillette Publication

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FUTURE FEATURES . . .

Automation in Water Works in the U.S.A.

How to Select and Apply Magnetic Meters

Fundamentals of Sludge Digestion (two parts)

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Briefs

Our Front Cover shows the Torresdale "Push Buttom Plant. The pretreatment basin is in the foreground; the filter building in the background. (Photograph courtesy Dorr-Oliver, Inc.

W & S W—Annual Photo Equipment Review of the progress made in New Equipment, Plants and Installations for the year, 1960—Page 37.

Water Pollution Control Federation—A report on the 33rd Annual Meeting of this noted organization, telling about the sessions held, the papers presented and the men who spoke—Page 48.

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A Whiff of Visitors finds Partially Oriented somewhat dissociated against the pressure of visiting firemen—Page 60.

The Outlook for Water Company Financing reveals some of the persistent problems private water companies face in trying to secure funds for needed improvements and expansion—Page 61.

Occurrence of Beggiatoa Species (Research Progress Report) in water supplies has been studied and the conclusion has been reached that these bacteria are unsatisfactory as indicators of pollution—Page 65.

Excavation and Pipe Foundations for Sewage Collection Systems reviews some of the most important construction points to bear in mind during water and sewage pipe construction—Page 68.

Editorial—The First National Conference on Water Pollution—A comment on what happened and its significance—Page 73.

Water Treatment Plant Reduces Chemical Conveying Costs tells how the Brandon, Maintoba water treatment plant can now purchase its main chemicals in bulk—Page 74.

"Keep 'em Rolling" A New Department

Beginning with this month's issue, W & SW will present a monthly article by C. G. Cunningham providing practical advice and data for the care of Water and Sewage department's service and maintenance vehicles.

Mr. Cunningham is a noted authority in the automotive and truck maintenance field, and his articles have appeared in leading national publications.

Because the economy of administering a water utility is inescapably related to the efficiency (or inefficiency) with which its service and maintenance departments are run, we believe these articles will prove a time and money-saving source of information. To those water and sewage works men concerned with the proper and reliable operation of their service trucks and automobiles, dozers, backhoes, crawlers, cranes, mobile well drillers, etc., we suggest, "Keep 'em Rolling." (Page 76A).

Index Available

The Index for 1960 **Water & Sewage Works** is now available. Copies will be furnished upon our receipt of a written (letter or post card) request.

Water & Sewage Works is published monthly with an extra issue in August. Subscriptions including the Reference Number issue in the U.S. and Canada, 1 year $5.00; 2 years $7.50; 3 years $10.00. Other countries $1.50 per year additional. Single copies 50c except Reference Number $1.00.

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E. Scranton Gillette, President; C. T. Gillette, Secretary; and H. J. Conway, Treasurer.

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Washington Viewpoint

Very much apropos of the National Conference on Water Pollution in Washington December 12-14, were a series of four developments in the Capital City:

1. First reports on a nation-wide survey of fish kills in U.S. streams and lakes, which (in a 31-state area) put the finger as expected on agricultural pesticides, industrial wastes and domestic sewage, in diminishing order. The survey, covering 31 states, was reported by the U.S. Public Health Service, and it blamed pesticides and industrial wastes for 70 per cent of fish kills reported; domestic wastes for 8 per cent; all other causes (including pollution from ships, pipeline breaks and "unknown") 28 per cent. Fish kills reported ranged from 100 to 182,000 (with the exception of a single pollution kill of more than 5 million by industrial wastes in the Kanawha River last August).

2. An advisory committee to the Surgeon General called for a three-fold increase in the U.S. research effort to control air pollution—a jump to about $32 million annually by 1968, with the Federal Government assuming 40 per cent of the cost, industry 28 per cent and state and local governments 32 per cent.

3. Public Health Service, in an estimate prepared for the Pollution conference, put a $10.6 billion cost on the task of cleaning up national water sources over the next 10 years—about half of this amount to come from public coffers. In the next 10 years, said the report, cities alone must spend $5.28 billion to meet their own needs for water treatment.

4. The U.S. Chamber of Commerce used the pollution Conference as a sounding board for its well-known contention that "responsibility for solving water pollution problems rests with state and local governments and industries. "Pollution and its correction are so closely connected with local industrial processes and with public water supply," said a Chamber statement, "the problem can be.... met only if state and local governments and industry assume the major responsibility..."

* * *

Related to the Conference—for its broadest implications, of course—was still another Federal action: Filing of Contempt of Congress actions against Austin J. Tobin, executive director of the Port of New York Authority. You may recall that the threat of this action, late in the last session of Congress, produced legislation (too late for action) that would specifically exempt interstate compacts from Congressional committee meddling.

Problem, as some Congressmen and many engineers see it, is that most of the interstate compacts in existence today concern water or water use—either from the standpoint of operation of port facilities and much more preponderantly from the standpoint of pollution control. Continued interference by Congressional committees in the internal affairs of these compacts could be a serious threat to their operation—and even to the value of their securities.

You may recall the circumstances that started the action: A subcommittee of the House Judiciary Committee decided to investigate PNYA's activities, ordered Tobin and others to appear in Washington with certain records. Tobin appeared, but refused to produce the records, on ground that PNYA is a bi-state agency, and he is subject only to orders of the Governors of New York and New Jersey. The two governors—one a Democrat, the other a Republican—strongly backed Tobin's

stand. However, enough Congressmen were convinced that, since they must first sanction all such interstate agreements, they should also have the right to investigate them; thus a contempt motion was passed.

* * *

There's a sobering note for water and sewage works men in those optimistic figures that the U.S. Department of Commerce is putting out concerning construction prospects for 1961. Commerce expects a record year ($57.3 billion total to be exact) up about 4 per cent from 1960, and up roughly $1.1 billion from the peak year of 1959.

The only bleak spot, according to the Commerce survey, will be sewage utilities, which are expected to drop about 6 per cent (to $835 million) for the year. Water works construction, however, is expected to rise by 2 per cent, to $1.525 billion.

It is interesting, though, that other indicators of construction activity don't particularly bear out this pessimistic outlook. For instance, the respected Investment Bankers Association, tallying votes at the Nov. 8 election, found that voters had approved bond issues valued at $1.998 billion—98.1 per cent by value and 60 per cent by number—to finance water and sewer projects. (Biggest share of this, of course, was California's huge, $1.7 billion, issue to pay for its scheme to transfer water from the northern part of the state to the south, through the San Luis project approved by Congress last session.)

It's to be noted, by the way, that the one category of bond issues that voters turned down heavily was bonds to support recreational activities, which went down to the tune of less than 40 per cent (by number) approved to more than 60 per cent disapproved.

Other observers of the construction scene had already noted a slump in work proposed for next year, the basis for the Commerce report of a small slide in total work. Even the expected doubling of Federal grants for pollution work (a revival of last year's vetoed Blatnik bill) won't take effect for a while.

* * *

Bookshelf item: "The Feasibility of Curved Alignment for Residential Sanitary Sewers", a study of the use of curved sewers instead of the conventional grid-iron pattern, where curved streets are installed. The report is one of a series of some 25 such studies under Federal Housing Administration's Technical Studies Program started in 1956. It is being released to local and county health officials, consulting engineers and other interested governmental agencies. You can get a copy by writing to FHA, Washington 25, D.C.

* * *

There should be great interest for sanitary engineers in that new (and, for the moment, experimental) approach by the Federal highway services and the Housing and Home Finance Agency to the general problem of urban planning. As you know, both HHFA and the Bureau of Public Roads may spend some of their funds for urban planning—under the new approach, joint steering committees will be formed (including local officials) and planning funds pooled, for development of coordinated plans, cutting out a lot of existing red tape and cross communications. Water and sewer projects connected with renewal programs will, of course, come into such consideration. Exact machinery hasn't yet been detailed, but you can get preliminary information from your HHFA regional office.

* * *

Further emphasis on the need for clearing and controlling stream pollution is contained in the Bureau of Reclamation's midwinter report on water storage in the 17 Western states. Said BuRec: Many areas will require median or above median runoff next season to assure normal water deliveries for irrigation and domestic supplies.

News—Here & There

Swedish Water Lab for Erosion Studies

A water laboratory has recently been taken into use at the Geographical Institute of Upsala University. One of the few of its kind existing in Europe, it will be used principally for basic research into erosion and sedimentation problems.

The laboratory includes a large platform where at present a scale model of the Hoffelssandur delta in Iceland has been built up, and a 45 ft glass chute through which water is pumped in a closed system. The chute can also be used for wind erosion tests. In addition, there are facilities for studies of frost and cold erosion in two sub-zero chambers, where the temperature can be kept at 30 degrees below zero Centrigrade.

Frederick H. Waring, Orsanco Pioneer, Retires

According to the Federal Public Health Service, water is used in the Ohio Valley at least four times before it reaches the Gulf of Mexico. Contributing to the fact that it can be used safely that many times is the anti-pollution controls set up through the "reasonable, soft-glove of enforcement" of Frederick Holman Waring, who is retiring at the age of 70 as Chief of the Division of Sanitary Engineering of the Ohio Department of Health.

Waring's successful effort for pollution abatement in Ohio and in the Ohio River is one of the reasons the Public Health Service can concentrate its efforts on the Missouri-Mississippi River watersheds, without having to worry about the Ohio River.

Mr. Waring was one of the prime instigators in the ambitious eight-state Ohio River Valley Sanitation Commission's establishment. Now being installed along the Ohio River are electronic units equipped with detectors that translate changes in the chemical content of water into electrical impulses. These impulses will be flashed to the commission headquarters at Cincinnati and there converted into data that will amount to a "water-safety" alert for users downstream.

Mr. Waring will continue as secretary of the Ohio River Valley Sanitation Commission, despite his enforced retirement as director of the Ohio Division of Sanitary Engineering.

He has been the recipient of many honors, one on his 70th birthday when he was presented the Federation Emerson Medal for 1960 by

One of the many tributes paid Fred H. Waring came at an American Clay Sewer Pipe Association luncheon when Association President A. G. "Ted" Cochran presented Mr. Waring (left) with his likeness in a three-dimensional wood carving imported from Finland.

the National Water Pollution Control Federation, a top award given only to those who have made great achievements in the waste water technology field.

Ten years were required by Mr. Waring and others for the formation of the Ohio Water Pollution Board and the passage of necessary legislation in 1952 to require that every city, village and industry purify sewage before it is discharged into a river or creek.

The battle to clean up the Ohio River Valley started in 1938 but the Ohio River Valley Sanitation Commission did not come into being until 1948.

One official of the Public Health Service at Washington recently was quoted as saying that "it is inevitable that the tempo of our activity" in the enforced construction of waste treatment plants will be stepped up.

The fact that Uncle Sam's "stepped up activity" need not include Ohio and the Ohio River is due to the contributions of men like Fred Holman Waring.

Rutgers Announces Research Fellowships

Post Doctoral Research Fellowships for Chemists and Bio-Chemists in a New and Challenging Field.

Basic investigations in air and water sanitation; environmental hazards; physical, chemical, and biochemical transformations; radioactive tracer studies. Stipend $6000 per year, tax exempt; one month vacation. Open to U.S. citizens only. Available Feb. 1, July 1 and Sept. 1, 1961. Include personal data in first letter.

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Write to: Dr. H. Heukelekian, Department of Sanitation, Rutgers University, New Brunswick, New Jersey.

PHS Publishes Membrane Filter Booklet

The Division of Water Supply and Pollution Control of the U. S. Public Health Service recently announced the publication of "The Membrane Filter," a teaching aid intended to supplement a filmstrip released last year under the same title.

With text and illustrations, the booklet explains the use of the membrane filter technique in the bacteriological analysis of water.

At 20 cents a copy, quantity purchases of this booklet (PHS Publication 749) may be made from the Superintendent of Documents, Gov-

CONTINUED ON PAGE 10A

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News—Here & There

CONTINUED FROM PAGE 8A

ernment Printing Office. Single free copies may be obtained from the Division of Water Supply and Pollution Control, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

Elmer W. McClave Dies

Death has claimed Mr. Elmer W. McClave, 67, secretary-treasurer of the Superior Clay Corp., Uhrichsville, Ohio, and the Peerless Clay Corp., Toronto, Ohio. Mr. McClave, widely known in the Clay Industry, died in Pittsburgh, Pa., on Nov. 14, following a heart attack.

Mr. McClave was on the Board of Directors of the Clay Sewer Pipe Association, Inc., Columbus, Ohio.

First Report on Nationwide Fish Kills

The United States Public Health Service has announced that first reports from 31 States indicate that agricultural pesticides and industrial wastes caused 70 per cent of the 185 pollution-caused fish kills along more than 600 miles of streams and 5,000 acres of lakes during a Nationwide Federal-State cooperative study from June to October 1960.

The continuing National collection of reports of fish kills began several months ago between the Public Health Service and the States to get some indication of their prevalence and causes on a Nationwide basis.

Fish kills are deaths of varying numbers of fish in a specific area within a short period of time. They usually occur because of the presence in a river of a foreign substance that destroys the ability of the fish to live. Foreign matter comes either from the dumping or spilling of a large amount of material such as chemicals, or by the slow accretion of a substance that makes the water intolerable to fish.

This first Nationwide study of stream fish kills showed that agricultural poisons accounted for the largest number, or 73 out of the total 185 State reports. Industrial wastes were listed as the cause in 57, domestic sewage was listed 15 times (or eight per cent) while other causes (pipeline breaks, shipping pollution, etc.) numbered 17 fish-kills, and unknown causes 28. In some instances, one or more causes were listed.

Approximately half of the reports received by the Public Health Service gave estimates of total fish kills, ranging, with one exception, from 100 to 182,000 and averaging 6,100 fishes per kill by pollution. One large non-representative single pollution kill of 5 milion fish (mosty trash and forage types) was caused by industrial wastes in the Kanawha River during two days in August over a distance of 19 miles.

The USPHS reported that quarterly summaries of raw data without technical interpretation are being provided to State cooperators, the United States Fish and Wildlife Service, and other organizations and individuals upon request.

ORSANCO Publishes Report for Governors

Rallying to the leadership provided by eight states, the people in the Ohio Valley have effectively reversed the trend of half a century of stream pollution. This is one conclusion in the twelfth annual report of the Ohio River Valley Water Sanitation Commission (ORSANCO), which was transmitted December 1, to the governors of Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

Cited as the most dramatic manifestation of change is the situation on the Ohio River itself. Here, 95 per cent of the population is served by sewage treatment works operating or under construction, as contrasted with less than one per cent in 1948. It was in 1948 that the eight states signed a compact establishing an interstate commission to coordinate efforts in a regional crusade for clean streams.

In transmitting the report, Chairman Ross H. Walker told the governors: "You will find reason for pride in what has been accomplished by the states, their communities and their industries, who are laboring together as neighbors in this mutual task. But this satisfaction must be tempered with the knowledge that safeguarding water resources used by ten million people in the Ohio Valley district claims further effort and constant vigilance. Our endeavors to this end are detailed in the report".

Among the matters in the report to which Mr. Walker referred were: Steps that have been taken this year in cooperation with the coal industry, which hold promise for amelioration of mine-acid discharges.

Improvement of a hazard-alert system to deal promptly with incidents involving accidental spills and discharges into streams.

Extension of water-quality monitor and surveillance practices, notably by the application of electronic sentinels.

Curtailment of oil pollution resulting from careless or incompetent operations in the transport, storage and use of oil products.

Acceleration of action by those municipalities and industries who have not yet met their obligations to curb waste discharges.

Intensification of efforts to inform the public on pollution control, with emphasis on the production and use of documentary films, television and radio transcriptions.

Copies of the 28-page report may be obtained by addressing the pollution control agencies in the capitols of each of the signatory states, or the Commission at 414 Walnut Street, Cincinnati 2, Ohio.

Septic Tank Care

One of the least expensive, as well as most popular publications sold by the U. S. Government Printing Office in Washington is "Septic Tank Care," which sells for five cents a copy. Written by staff engineers of the General Engineering Program of the Public Health Service, the leaflet gives details about the maintenance of septic tanks used by the individual home owner, and it has sold almost one million copies.

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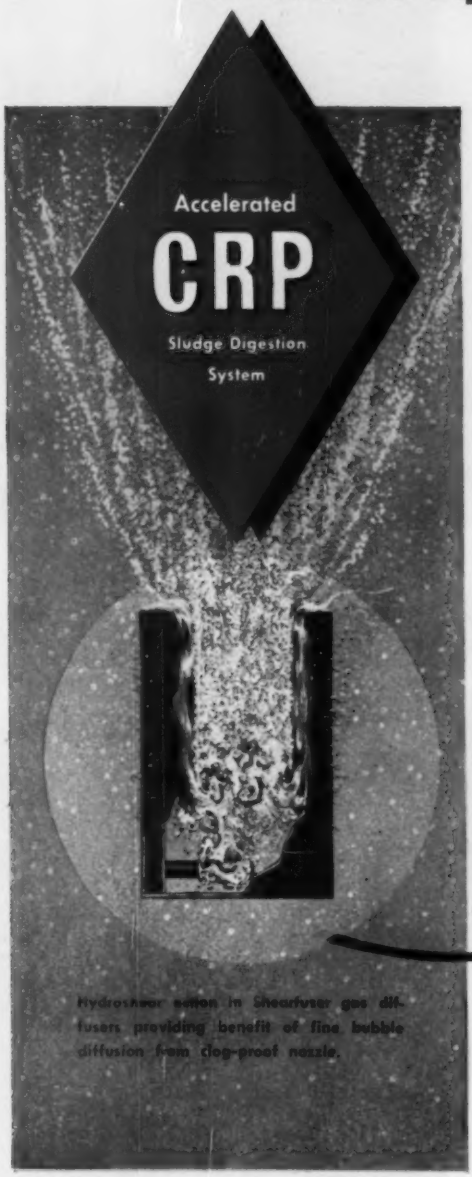

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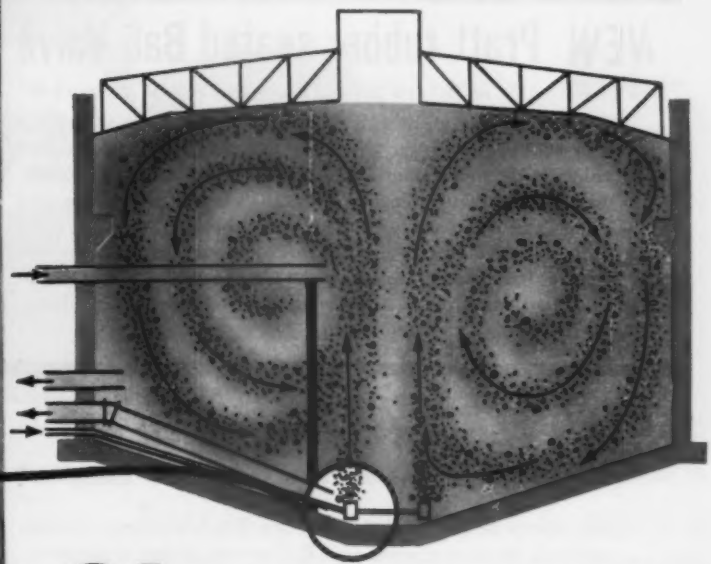
3. No interruption of digester operation.
4. Increased mixing rate from fine bubbles induced by Hydroshear action.

*CRP Accelerated Sludge Digestion System**

Reduces tank volume required by high sludge loading rate. Produces homogeneous sludge through continuous mixing.



64 operating and specified installations of the CRP System* with "Chicago" gas mixing equipment since 1952 prove its unparalleled acceptance . . . servicing cities from 2000 to 250,000 population.

*System license under U. S. Patent No. 2777815 and foreign patents available.

†Pat. Pending

©1960—CP—F. M. C.

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION
CHICAGO PUMP
622H DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

WATERWORKS VALVES for the '60s!

These new, modern, rubber seat valves are especially engineered to meet the demands of the next decade—a decade in which dramatic population increases will place ever increasing loads on waterworks and sewage equipment.

NEW high pressure Butterfly Valves

for pressures to 150 psi. In sizes 4" through 72"

The R-2 series of Rubber Seat Butterfly Valves meet or exceed all AWWA Specifications for high pressure valves, and offer operating advantages far beyond basic requirements. The time-proven Henry Pratt features are now augmented by such new design features as: *Adjustable seat* that can be tightened (or even replaced) without removing shaft or disc. *Lower seating torque* lowers actuator cost and provides remarkable ease of operation. The R-2 is completely bubble-tight to 150 psi and offers longer operating life than ever before possible. Write for complete information.

NEW Pratt rubber seated Ball Valve

in 150 and 250 psi ratings. Sizes 10" through 48"

The famous Henry Pratt Company rubber seating philosophy has now been applied to the Ball Valve. This pioneering achievement enhances the inherent advantages found in Ball and Cone Valves. Just as the disadvantages of metal-to-metal seated gate and butterfly valves were eliminated, and the use of rubber seat butterfly valves made a waterworks industry standard by the original Pratt design, we expect the use of resilient seating in the Pratt Ball Valve to add a new perspective to waterworks valving.

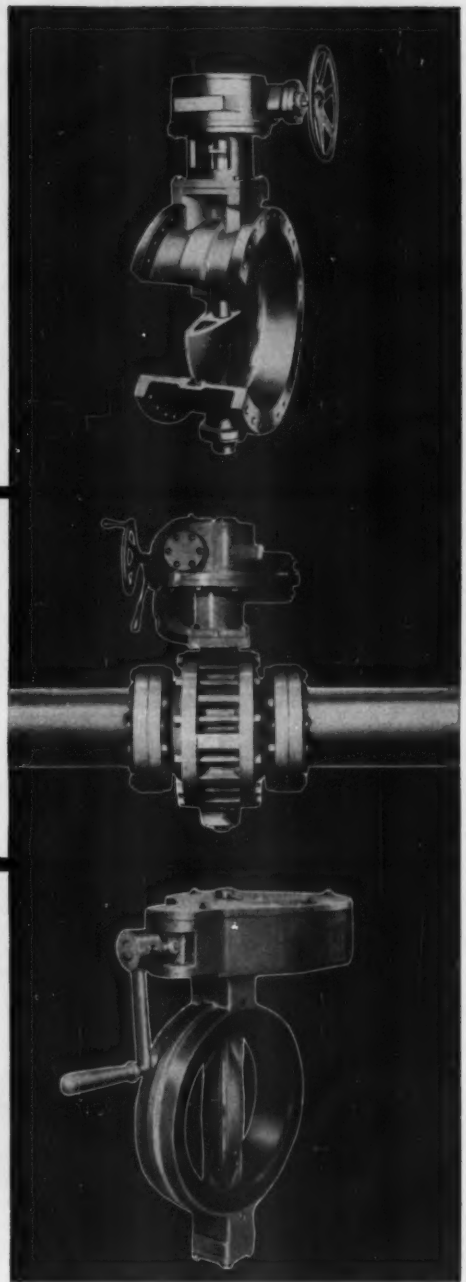
Write for Bulletin BA-1B

NEW Monoflange Mark -II

for pressures to 150 psi. Sizes 4" through 20"

No valve is easier to install or operate. The Monoflange fits conveniently between existing pipe flanges—no gasket is necessary. With completely tight shut-off at 150 psi, the Monoflange Mark II finds many applications where economy is paramount, but long life is necessary. Fully complies with all structural and operator requirements of AWWA Specification C504-58 for rubber seat butterfly valves with the exception of body configuration.

A most complete 60 page catalog has been prepared which contains all necessary information. Write for Bulletin 10-B.



HENRY PRATT® Creative Engineering for Fluid Systems

HENRY PRATT COMPANY
319 W. Van Buren Street, Chicago 7, Illinois
Representatives in Principal Cities

NIGHT AND DAY

twenty-four hour service

PUMPS • WATER WELLS • WATER TREATMENT

Layne knows that an unfailing supply of water is vital, whether it be for municipal, industrial or agricultural use. With Associate Companies located throughout the world, Layne can provide the speed, the trained technicians and the quality parts to remedy your water problem. Over 75 years of experience accounts for the ever increasing list of customers who depend on Layne for service. For service night and day, call the Man From Layne.

Write for Layne Service Bulletin 100.

LAYNE OFFERS COMPLETE WATER SERVICE: Initial Surveys • explorations • recommendations, site selection • foundation and soil-sampling • well drilling well casing and screen • pump design, manufacture and installation • construction of water systems • maintenance and service • chemical treatment of water wells water treatment—all backed by Layne Research. Layne services do not replace, but coordinate with the services of consulting, plant and city engineers.

LAYNE & BOWLER, INC., MEMPHIS

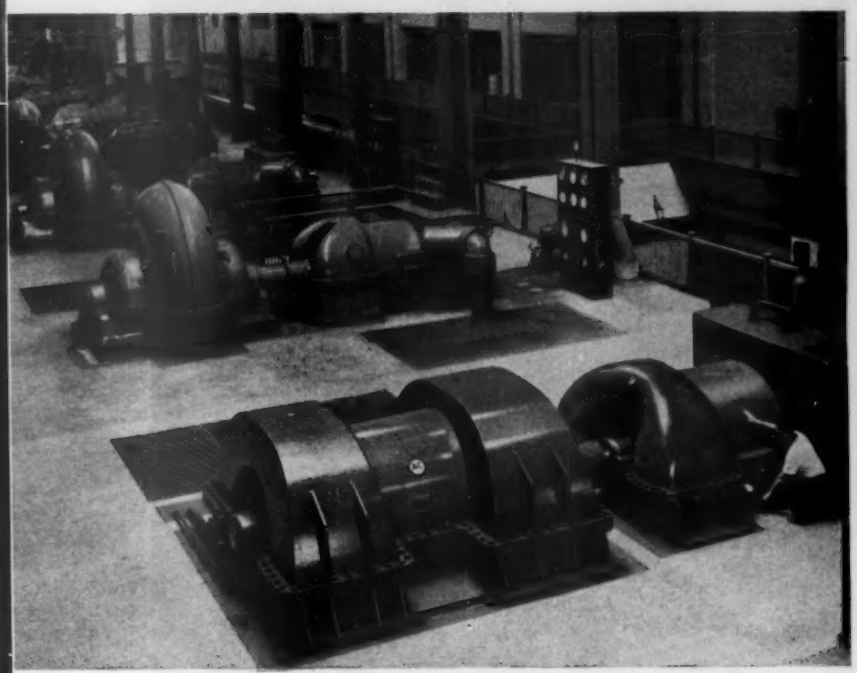
General Offices and Factory, Memphis 8, Tenn.

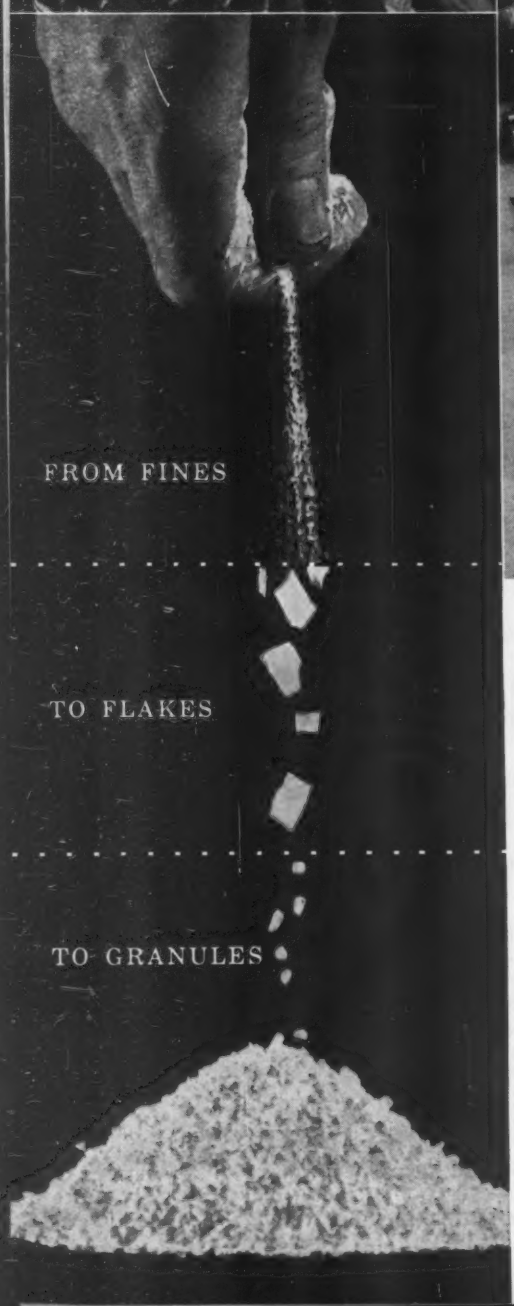
LAYNE ASSOCIATE COMPANIES THROUGHOUT THE WORLD

SALES REPRESENTATIVES IN MAJOR CITIES

New coil insulation means fast service: Here's downtime insurance you'll probably never need. The Silco-Flex insulation system on large A-C motors is so superior that coil failure is highly unlikely in ordinary service. Should failure occur, the usual 10-day rewind shouldn't be necessary. Usually eight hours should be enough for the entire job of replacing the coil.

Up to 15% greater compressor efficiency: Giving near constant capacity over a large variable discharge pressure range at high efficiencies, A-C axial compressors like this one . . . the first to be used for sewage aeration . . . are ideal base-load machines. They are up to half the size, one quarter less weight, 8% to 15% more efficient than comparable centrifugal compressors.





Fines from heat-dried sludge made useable: Heat drying of sewage sludge creates fines which fertilizer companies cannot use. An Allis-Chalmers continuous compacting process is now upgrading these fines at a large eastern city to make them saleable. Fines are formed into solid sheets, then broken into granules, then separated and sized for sale to a commercial fertilizer manufacturer.

A-C INDUSTRIAL EQUIPMENT DIVISION: motors, control, rectifiers, pumps, compressors, crushers, mills, screens, kilns, industrial systems.

OTHER A-C PRODUCTS: thermal, hydro and atomic electrical generating equipment; switchgear, transformers, unit substations; tractors, earth-moving equipment, engines, lift trucks.

A-1398

SpaceMaker, Pyro-Shield, Silco-Flex and ACAP are Allis-Chalmers trademarks.

ALLIS-CHALMERS

ideas and news:

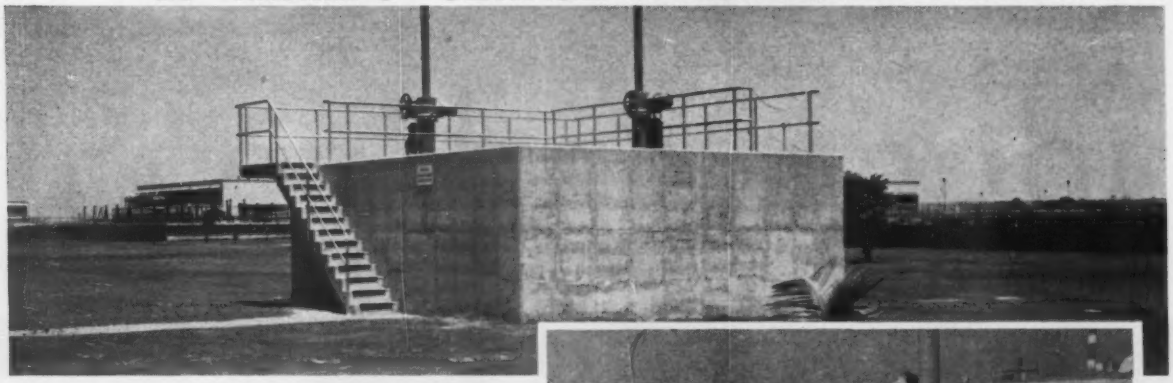
ACAP pump regulates flow instantly . . . without valves or varying pump speed. Proven ACAP (Adjustable Capacity, Adjustable Pressure) principle with internal pneumatic control automatically matches flow to demand. Regulation of flow through changing impeller clearances eliminates binding, plugging, saves power, allows system to operate at high efficiency regardless of demand.

So low, two fit where one used to go: This new SpaceMaker control center is the first completely new 2- to 5-kv motor controller development in more than a decade. New compact two-high design can cut floor space requirements in half. Complete drawout construction makes it the safest, most easily accessible controller on the market. New flame-retardent, track-resistant Super Pyro-Shield insulation adds to reliability, reduces size and weight. And, the all-new roll-out contactor has been designed specifically to cut maintenance time and costs.

Which of these productive ideas could be working for you?

A pump that adjusts automatically. A high-voltage motor control center. These examples demonstrate the extra value that is a standard with A-C . . . the greater efficiency and the added productivity which are yours when you buy A-C products, systems and services. Call your Allis-Chalmers representative for details on A-C "worth-more" features. Or write Allis-Chalmers, Industrial Equipment Division, 904 S. 70th Street, Milwaukee, Wisconsin.

at MIAMI'S SEWAGE TREATMENT PLANT...



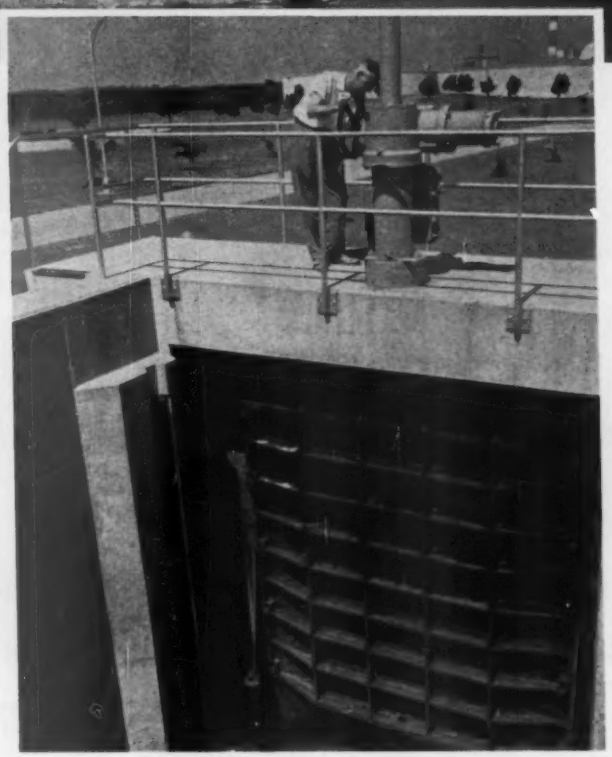
...2-108″ x 108″ RODNEY HUNT SLUICE GATES are push-button operated by LimiTorque MOTORIZED CONTROLS

LimiTorque automatically opens and closes sluice gates and valves from a conveniently located control point—eliminating guesswork and reducing labor costs. One man can operate any type of gate or valve quickly and dependably in remote, inaccessible or hazardous locations; thus vital operating procedure can be handled easily by key personnel, safely and economically, and at the correct speed . . . And these controls may be mounted on any size gate or valve, in almost any position or location.

LimiTorque controls can be field-mounted on existing equipment—contact your valve manufacturer, or our nearest sales-engineering office.

It is significant that far more LimiTorque Operators are used on Sluice Gates and Valves than any other operator in the World, because they are absolutely dependable at all times . . . you can "always count on LimiTorque."

Another point; where it is impractical to attach the control unit directly to the valve yoke on large Sluice Gate or Valve Installations, LimiTorque Floor Stands are available for direct mounting over the gate stem—or they are available with internally built controls (Open, Stop, and Close Switches and NEMA rated reversing controller)—all mounted in a self-contained Limit Switch Compartment. LimiTorque



Operators also provide a hand wheel for manual operation (in case of power failure)—and the hand wheel does not rotate during electrical operation.

There are many other exclusive features provided by LimiTorque in connection with the operators of all types and sizes of Valves, as well as Sluice Gates . . . Write for complete LimiTorque Catalog L-550, as well as special Bulletin 12-58 describing LimiTorques specially designed for operation of Sluice Gates—they will be sent gladly upon request on your Business Letterhead.

THERE IS NO SUBSTITUTE FOR

LimiTorque®

PHILADELPHIA GEAR CORPORATION
KING OF PRUSSIA (SUBURBAN PHILADELPHIA), PA.
Offices in all Principal Cities

INDUSTRIAL GEARS & SPEED REDUCERS • LIMITORQUE VALVE CONTROLS • FLUID AGITATORS • FLEXIBLE COUPLINGS
Limitorque Corporation • King of Prussia, Penna.

NOW THE FIRST MAGNETIC DRIVE METER WITH A DISC METER CHAMBER

THE Badger *Easy-Read**

GIVES NEW POWER TO A TIME-PROVEN PRINCIPLE

Here is performance unmatched by any other meter on the market. Only the Badger Easy-Read combines time-proven disc meter accuracy and dependability with the efficiency of magnetic drive.

The benefits of this new type meter are many, beginning with the elimination of the troublesome stuffing box and consequent drag and leaks.

Still more top features: a low-friction, self-cleaning sapphire jewel bearing, located in the water chamber, carries the thrust of the magnetic coupling . . . a tamperproof sealed register . . . a new, exclusive removable register . . . the most readable register face of any meter yet marketed.

And most important: Easy-Read's full-size disc and chamber provide interchangeability with standard Badger disc meters. You can modernize the Badger meters now on your system with a new housing top and register-gear train assembly.

Whether you convert your present system or install a new one — Badger Easy-Read means more economical operation, easier serviceability and dependable performance.

Ask your Badger representative now to give you complete details on the new Easy-Read meter.

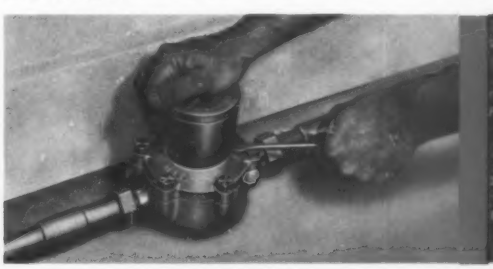
THE POSITIVE DRIVE OF PERMANENT MAGNETS

Each of the magnets that form the magnetic coupling consists of a non-corroding ceramic ring. They have the most desirable combination of magnetic properties and corrosion resistance available today. Intensive tests prove they are permanently magnetized.

Badger's magnets are also larger, giving greater power in the coupling to drive the register — power so strong it can drive *every* register or meter-driven accessory.

*Patent applied for

POWER THAT'S SEALED TIGHT



against leaks and tampering

against fogging, water and mud

Stronger magnets assure more positive drive

As water flows through the meter chamber, a full-size disc turns the lower drive assembly. The entire assembly, including the four-pole ceramic ring magnet, is suspended in a dual bearing system.

Badger's stronger magnets transmit power through the cast bronze wall separating measuring and register units. Four poles lock to provide positive drive.

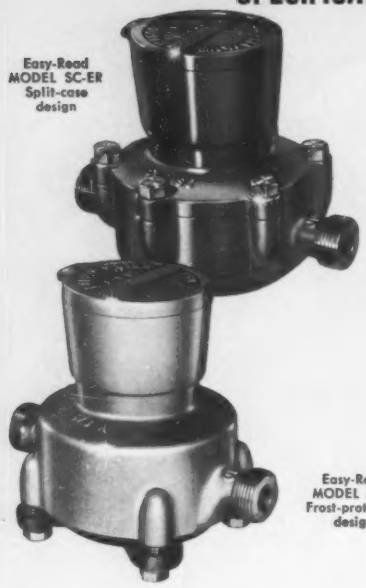
A—Sapphire jewel bearing. **B**—Driven magnet. **C**—Drive magnet. **D**—Disc. **E**—Radial bushing. **F**—Sealed register and gear train assembly.

THESE ARE *Easy-Read* exclusives:

BOLD NEW FACE—Digits are ¼" tall permanent, molded integral with wheel. Sixth number wheel extends totalizer capacity of ⅝" meter to 10 million gallons (1 million ft.).

REMOVABLE REGISTER is mounted by bayonet lock attachment. It's the only sealed, magnetic driven register that can be removed, even under water, without disturbing the meter in the line. Register and cover can be mounted in any of four positions for easier readings.

SPECIFICATIONS



Easy-Read
MODEL SC-ER
Split-case
design

Easy-Read
MODEL A-ER
Frost-protective
design

Meter Size Inches	Net Weight Lbs.	Length Inches	Width Inches	Height Inches	Port Holes Center to Base	Length Coupling Inches	Safe Operating Capacity G.P.M.
MODEL SC-ER							
⅝	10⅜	7½	5½	6¼	1⅞	2⅜	20
⅝ x ¾	10½	7½	5½	6¼	1⅞	2½	20
MODEL A-ER							
⅝	10⅝	7½	5½	6⅝	1⅞	2⅜	20
⅝ x ¾	10¾	7½	5½	6⅝	1⅞	2½	20

ANOTHER IN BADGER'S BIG PARADE OF NEW PRODUCTS FOR BETTER WATER METERING

Twice within a year, Badger has introduced pace-setting products to the water meter field. The Read-o-Matic®, the industry's first practical outdoor meter-register, and the powerful new Badger Easy-Read — to help water departments everywhere steadily increase operating efficiency and lower costs.

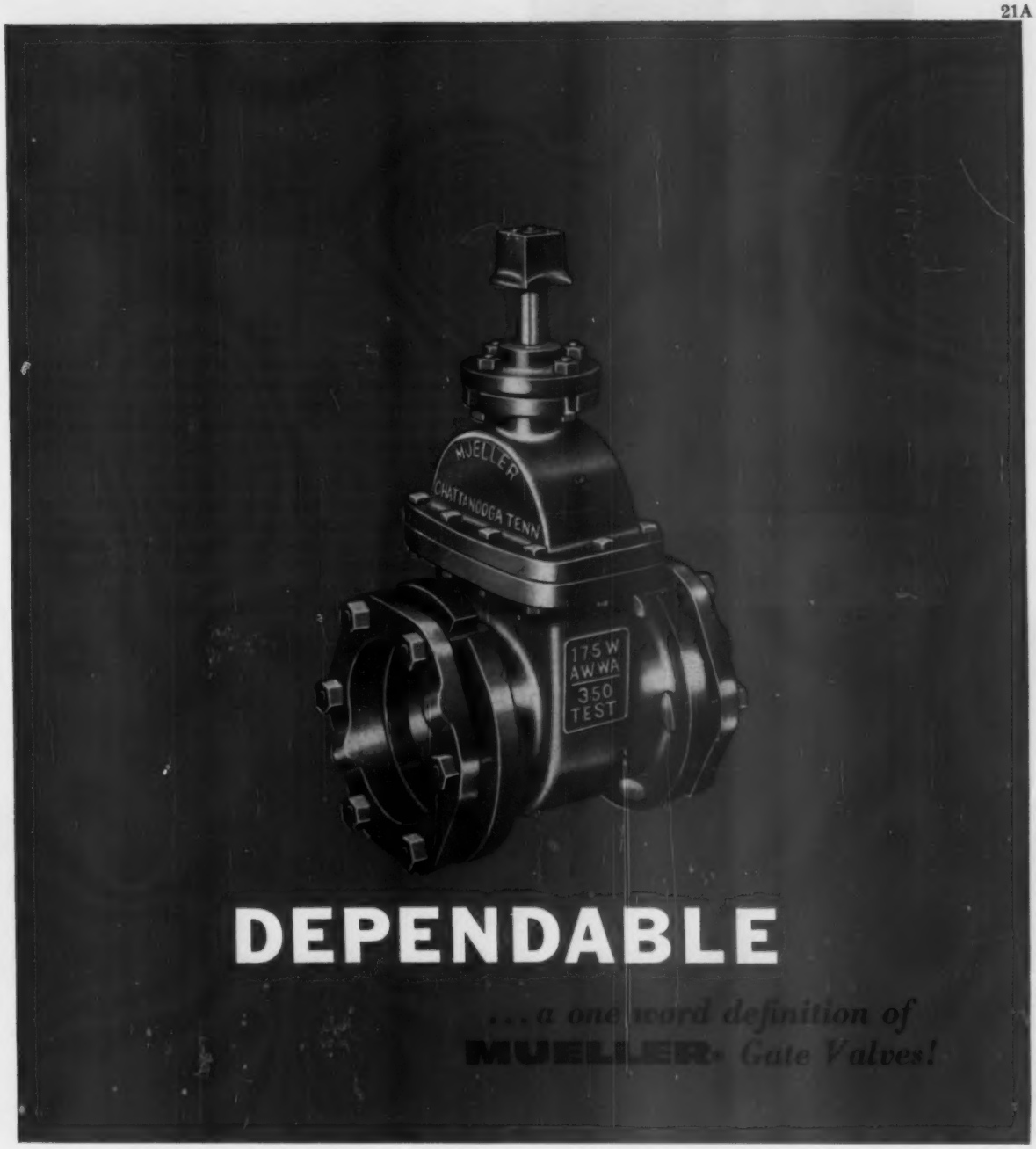
These products were developed after years of research and torture-testing. Work on a magnetic meter began in 1934. Badger's first magnetic drive meter was placed in service in 1940 (see inset photo).

These "pioneer" meters led to the development of the new Easy-Read and its superior, permanent magnets.

New products are part of Badger's program to better serve the water works industry. For information on any of our meter products, see your Badger representative or write direct to Badger Meter Manufacturing Company.

Badger Water Meters

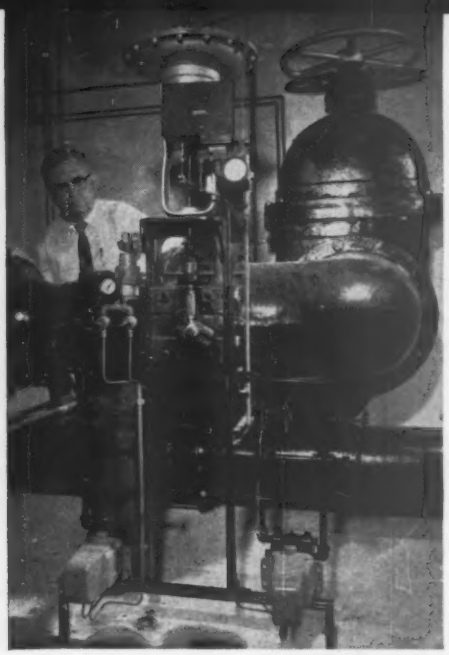
BADGER METER MANUFACTURING COMPANY
4545 W. BROWN DEER ROAD • MILWAUKEE 23, WISCONSIN
REGIONAL SERVICE CENTERS
Dallas 35, Texas — Seattle 4, Washington
Los Angeles (Compton), California — Long Island City 1, New York
Atlanta 18, Georgia — Milwaukee 23, Wisconsin
Cleveland 35, Ohio
BRANCH OFFICES in principal cities



Mueller Gate Valves in your water supply or fire protection system is your assurance of years of maintenance-free service. This fact is due largely to a design-exclusive . . . Mueller's Four Point Wedging Mechanism that assures tight, sure shut-offs. This unique principle exerts equal seating pressure at four points near the edge of each disc to eliminate deflection and distortion. Write for complete information on the variety of ends and wide range of sizes on these AWWA Gate Valves.

specify Mueller . . . there is no "equal"!

MUELLER CO.
DECATUR, ILL.
Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario



Honeywell built and

TORRESDALE..

Honeywell staff engineer makes final checkout of effluent rate-of-flow controller system. Note use of short form Venturi tube with pneumatically operated, full bodied, rubber seated A.W.W.A. butterfly valve and diaphragm motor operator with positioner.

View of north section filter gallery and control consoles. Plant is designed so that each section can work independently of the other with independent wash water supply and master control panel.

installed system controls . . .

. . $25 MILLION PUSHBUTTON WATER PLANT

Designed to provide normally 282 million gallons of water each day, Philadelphia's new $25 million Torresdale plant has a maximum capacity of 423 mgd. From the time raw Delaware River water enters the plant for pre-treatment until it's pumped into distribution mains from underground storage reservoirs, the purification process is constantly monitored and controlled by an extensive Honeywell system of pneumatic, electric and electronic instrumentation.

The nerve center of each of the 94 rapid sand filters is a stainless steel console housing a programming system that provides—at the operator's option—a fully automatic backwash sequence or manual operation. Other sub-systems provide for the monitoring of chemical levels in storage tanks with preset high and low alarms . . . maintenance of normal reservoir levels depending on the city's demands, by a combination of electronic level and pneumatic flow controllers . . . and a master control panel for each of the two filter galleries.

To take advantage of Honeywell's experience in applying these latest techniques in water plant instrumentation, call your nearby Honeywell field engineer . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Torresdale Water Plant, City of Philadelphia: Samuel S. Baxter, Water Commissioner
Consulting Engineer: Morris Knowles, Inc.—Pittsburgh
General Contractor: McCloskey and Company—Philadelphia
Mechanical Contractor: Ambrose-Augusterfer Corp.—Philadelphia

Each console includes instruments for recording filter operations and pushbutton controls for starting and determining length of backwash programming.

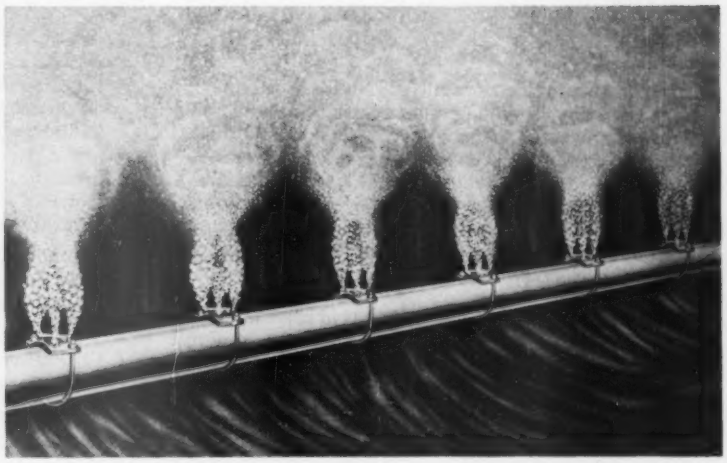
Water Commissioner Baxter and Deputy Commissioner Arnold analyze wash water consumption for north section filter gallery from data recorded on master control panel.

Honeywell

First in Control

SINCE 1885

efficient oxygenation
DIFFUSAIR *SPARJERS*



Jack-knife Headers
— for easy inspection

Self-cleaning Metering Orifices
— for uniform, clog-proof operation

Clustered Orifice Diffusion
— for controlled turbulence and intra-floc oxygenation

Diffusair SPARJERS combine controlled air bubble release with increased tank turbulence and circulation velocities to provide the most efficient oxygenation media available. In developing the SPARJER, Walker Process Engineers thoroughly investigated all factors involved in the complex process of aeration and oxygenation. As a result the thousands of SPARJERS installed in hundreds of installations during the past decade feature high O_2 absorption, no back pressure build-up to impair blower performance and low cost operation.

JACK-KNIFE pivotal headers are offered by Walker Process to provide a convenient and economical method of installing SPARJERS without extensive on-the-job pipe work. Walker Process JACK-KNIFE headers include extra heavy swivel joints that will not bind or freeze and an exclusive hydraulic hoisting mechanism. This rugged but simple lifting assembly is easily handled by one man.

Write factory at P.O. Box 266, Aurora, Ill. for equipment recommendations and details for your aeration project. Also, ask for bulletin 22-S-96 describing the new PLATETUBE porous diffusers.

WALKER PROCESS EQUIPMENT INC. AURORA, ILLINOIS

a leader in equipment for . . .

SEWAGE TREATMENT • WATER TREATMENT • INDUSTRIAL WASTE TREATMENT

In KNOXVILLE, TENNESSEE

TYLOX Rubber GASKETS, REXON Rubber GASKETS, and REXON PIPE COATING

PREVENT JOINT LEAKS, WHIP ACID ATTACK AND SPEED PIPE LAYING ON STORM-SANITARY SEWER PROJECT

Engineers and city officials went "Hamilton Kent" all the way, in the matter of selecting *leak-proof* pipe joints and *acid-resistant* pipe coating to protect Knoxville's new Riverfront-Willow Avenue sewerage and drainage project . . .

Heavy duty precision TYLOX Gaskets coupled the large diameter T & G concrete storm lines. REXON "K" Light Duty Gaskets jointed the smaller diameter B & S sewer lines, and tough, non-deteriorating REXON No. 2 Pipe Coating put a protective covering inside all lines that would serve nearby stockyards, butchering plants and other industrial installations.

In specifying Hamilton Kent TYLOX and REXON *rubber* Gaskets, and REXON Pipe Coating, engineers and city officials not only provided to the utmost for the safety and long life of the system, but made possible substantial savings in construction costs . . . Both TYLOX and REXON Gaskets are quickly assembled to pipe, and permit fast assembly of the line. Their flexible, *compression* seal compensates for pipe angularities, allows wet trench coupling, and immediate backfilling.

PROJECT: For City of Knoxville, Tenn., Riverfront-Willow Ave. storm and sanitary sewers.

ENGINEERS: H. R. Neal, City Engineer, and Roy I. Gentry, Service Director.

CONTRACTORS: Division A—Harrison Construction Company, Alcoa, Tenn. Division B—Blont Brothers Construction Company, Montgomery, Ala.

PIPE: T & G and B & S Concrete Pipe, manufactured by Sherman Concrete Pipe Company, Knoxville, Tenn.

5089

WRITE FOR BROCHURES describing and illustrating use of Hamilton Kent TYLOX and REXON Gaskets and REXON Pipe Coating. Specify these products to protect your pipe projects from leakage and acid attack.

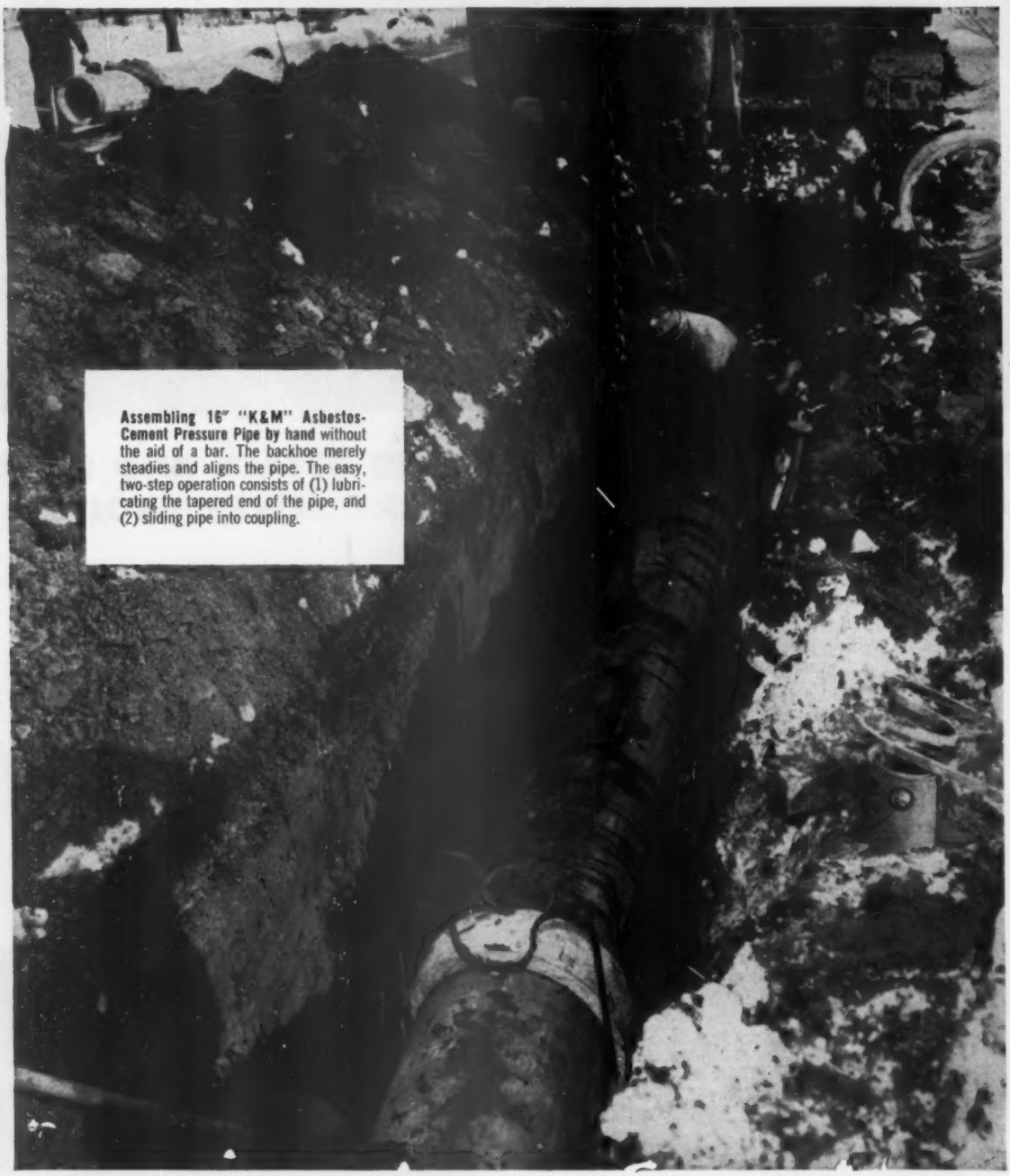
HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

427 West Grant Street Orchard 3-9555

"'K&M' ASBESTOS-CEMENT

LAYS AS FAST AS



Assembling 16" "K&M" Asbestos-Cement Pressure Pipe by hand without the aid of a bar. The backhoe merely steadies and aligns the pipe. The easy, two-step operation consists of (1) lubricating the tapered end of the pipe, and (2) sliding pipe into coupling.

PRESSURE PIPE

A SHOVEL DIGS..."

G&B Construction, Inc., Youngstown, Ohio, installs 4½ miles of "K&M" Asbestos-Cement Pressure Pipe for the Austintown District of Mahoning County, Ohio

"You can lay 'K&M' Pipe as fast as a shovel can dig. There is nothing that will hold you back with this pipe. When you can lay a 16" water line, and it goes in as easy as an 8" water line, what more could you ask? They've got a good joint with that FLUID-TITE® Coupling . . . the pipe is wonderful to put together. Of all the 'K&M' Pipe we've laid, we never had a coupling break."

Those are the comments of Louis Gulfo, partner with Mike and James Bertilacci in G&B Construction, Inc. They installed "K&M" Asbestos-Cement Pressure Pipe in bitter cold, during February and March 1960. However, neither rain, snow, nor mud interrupts the installation of this modern pipe. The exclusive, patented "K&M" FLUID-TITE Coupling and the simple fitting procedures required make assembly easy.

Little or no maintenance will face Mahoning County, which built and will operate the system for a year, or the City of Youngstown, Ohio, which will then take it over. Being non-metallic, "K&M" Asbestos-Cement Pressure Pipe won't rot, corrode, or tuberculate, and is immune to electrolysis. The suppliers of this pipe were Trumbull Plumbing Supply Co., Warren and Youngstown, Ohio.

Now, in addition, you may use quality "K&M" Plastic Pressure Pipe in the same system with "K&M" Asbestos-Cement Pipe, if desired.

Write today for more information on "K&M" Asbestos-Cement Pressure Pipe to: Keasbey & Mattison Company, Ambler, Penna. Dept. P-911.

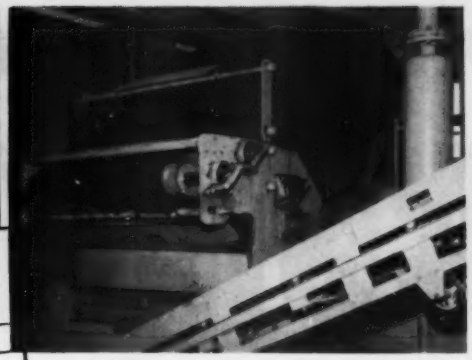
K·M BEST IN ASBESTOS

Keasbey & Mattison at Ambler

Left to right: Louis Gulfo, G&B Construction, Inc.; Dale MacCleary, sales manager, Trumbull Plumbing Supply Co.; James Bertilacci, G&B Construction, Inc., Burke Lyden, Asst. Chief Engineer, Youngstown, Water Dept., Jim Bisciglia, Asst. Engineer, Mahoning County, and J. Henry Painter, Trumbull Supply Company.

3 miles of 16" "K&M" Asbestos-Cement Pressure Pipe were installed. Here, we see it ready for installation along Webb Road, in Austintown Township. In branching from the 16" water line, Mahoning County used 1 mile of 12" "K&M" Asbestos-Cement Pressure Pipe and ½ mile of 8" "K&M" Asbestos-Cement Pressure Pipe. Specifications call for 90 lbs. pressure when line is in operation serving 16,000 residents.

COILFILTER DEWATERS BEATRICE, NEB., FRESH SOLIDS AT 9.2 LBS. PER SQ. FT. / HOUR MONTHLY AVERAGE RATE



COILFILTER OPERATING DATA

City of Beatrice, Nebraska — Month July

100 — Equiv. Pop. (Sus. Solids) 12848

sh Solids - Primary & ckling Filter

GE Pounds Dry Solids Filtered	Chemicals vs Dry Wt. Solids Percent Used: Pounds Used Lime	$FeCl_3$	CaO	$FeCl_3$	FILTER CAKE % Moisture	Yield lbs./sq. ft./hour	pH sludge before chem	pH sludge after chem	pH sludge from **
7197.0	850	89	7.1	1.2	76	8.4	6.4	11.8	
10773.2	735	120	6.8	1.1	72	10.7	6.8	12.0	
7619.5	420	64	5.5	0.8	76	10.8	6.8	11.8	
7824.5	490	67	6.2	0.8	76	10.4	6.4	12.0	
5724.9	550	58	6.7	1.1	74	8.2	6.2	11.8	
3973.3	400	42	7.0	1.5	76	7.9	7.0	11.8	
6620.7	700	64	7.4	0.9	75	9.4	6.8	11.8	
5764.2	600	59	7.2	1.2	74	8.2	6.6	11.8	
5615.3	500	47	6.1	0.9	72	11.2	6.8	12.0	
6714.2	650	64	6.7	0.9	76	9.5	6.8	12.0	
5874.4	650	61	7.7	1.3	79	8.3	6.6	11.8	
5939.2	600	67	7.0	1.1	76	8.4	6.8	11.6	
4.2 79658.4	7145	802							
61 6638.2	595.4	66.08	6.71	1.06	75.1	9.2			

ays 39.82 (Tons) 3.57 (Tons)

**Note: PC … HT fo… D for …

MONTH'S AVERAGE

LTER DEWATERING COST

ount ed	Unit Cost	Cost per Month	Cost/ton dry wt.	Cost/capita/yr.
02	12.5¢	100.25	2.86	.093
145	1.2¢	85.74	3.32	.080
147		185.99	6.18	.173

3-460 *For Filtration Operation Only

Signed: Wayne …itting
Title: Water Supt.
Date: 8-8--60

Keep in Duplicate
Mail one copy to:
Komline-Sanderson Engineering Corporation
Peapack, N.J.

The Beatrice, Nebraska, sludge dewatering report shown here is not unusual; it is representative of the scores of Coilfilter fresh solids dewatering installations throughout the country, as well as the hundreds of other Coilfilters dewatering digested or primary and trickling filter sludges.

Note the low cost of Coilfilter dewatering — it performs where other dewatering devices only claim. The exclusive, self-cleaning, non-clogging filter media is guaranteed for twenty years.

Consulting Engineers for Beatrice, Nebraska, STP: Henningson, Durham & Richardson, Inc., Omaha, Nebraska

KOMLINE-SANDERSON
ENGINEERING CORPORATION
PEAPACK, NEW JERSEY
CANADIAN OFFICES AND PLANT
BRAMPTON, ONTARIO, CANADA

KOMLINE-SANDERSON'S NEW ADMINISTRATIVE CENTER AT PEAPACK, N. J.

LANDMARKS OF MUNICIPAL PROGRESS...

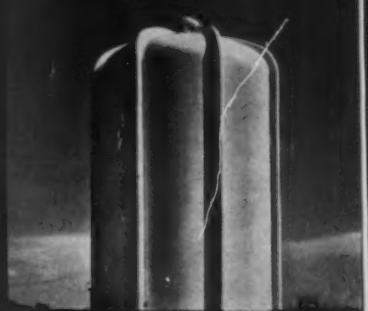
Modern Water Storage Tanks built by

CB&I

RADIAL-CONE
Standard sizes: 500,000 to 3,000,000 gals.

WATERSPHERE
Standard sizes: 25,000 to 250,000 gals.

ELLIPSOIDAL
Standard sizes: 15,000 to 500,000 gals.



ORNAMENTAL STANDPIPE
No limit to capacity

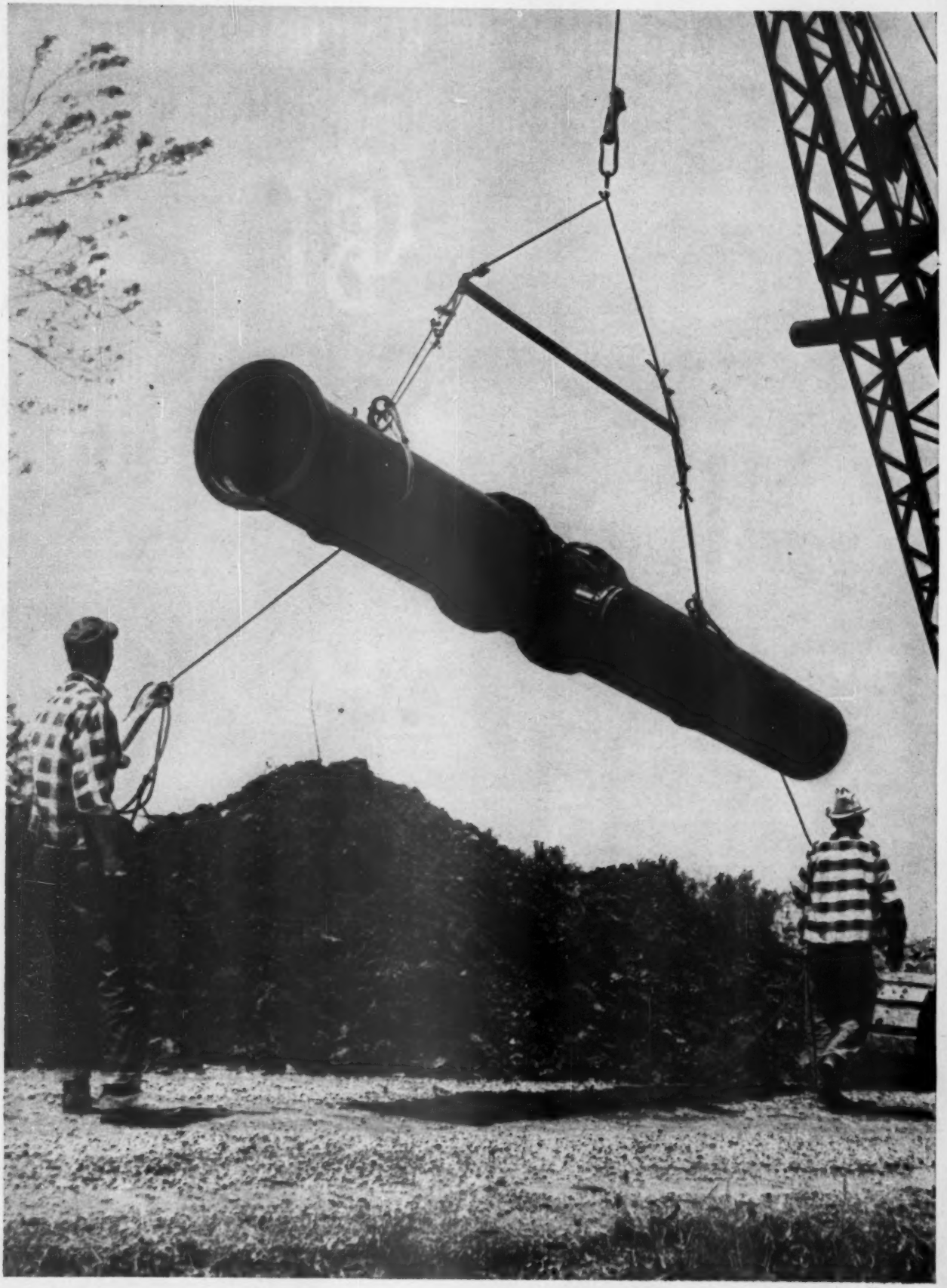
SPHEROIDAL—Standard sizes: 200,000 to 3,000,000 gals.

WATERSPHEROID
Standard sizes: 250,000 to 500,000 gals.

CHICAGO BRIDGE & IRON COMPANY

332 SOUTH MICHIGAN AVENUE
CHICAGO 4, ILLINOIS

OFFICES AND SUBSIDIARIES IN PRINCIPAL CITIES THROUGHOUT THE WORLD



PIPE THAT SHOULDERS A HEAVY LOAD WITHOUT SHOWING ITS AGE

Recently installed in a town in Illinois, this cast iron pipe water supply system now serves a large industrial area.

Besides the internal pressure of supplying the heavy daily demand, there is a heavy load overhead, too. The industrial area is a packaging and distribution center. Large numbers of fully loaded rail cars and trucks come and go every day.

As far as the cast iron pipe is concerned, this is all in a day's work.

Cast iron pipe shoulders heavy loads—interior and exterior—year after year; performs efficiently for a century or more.

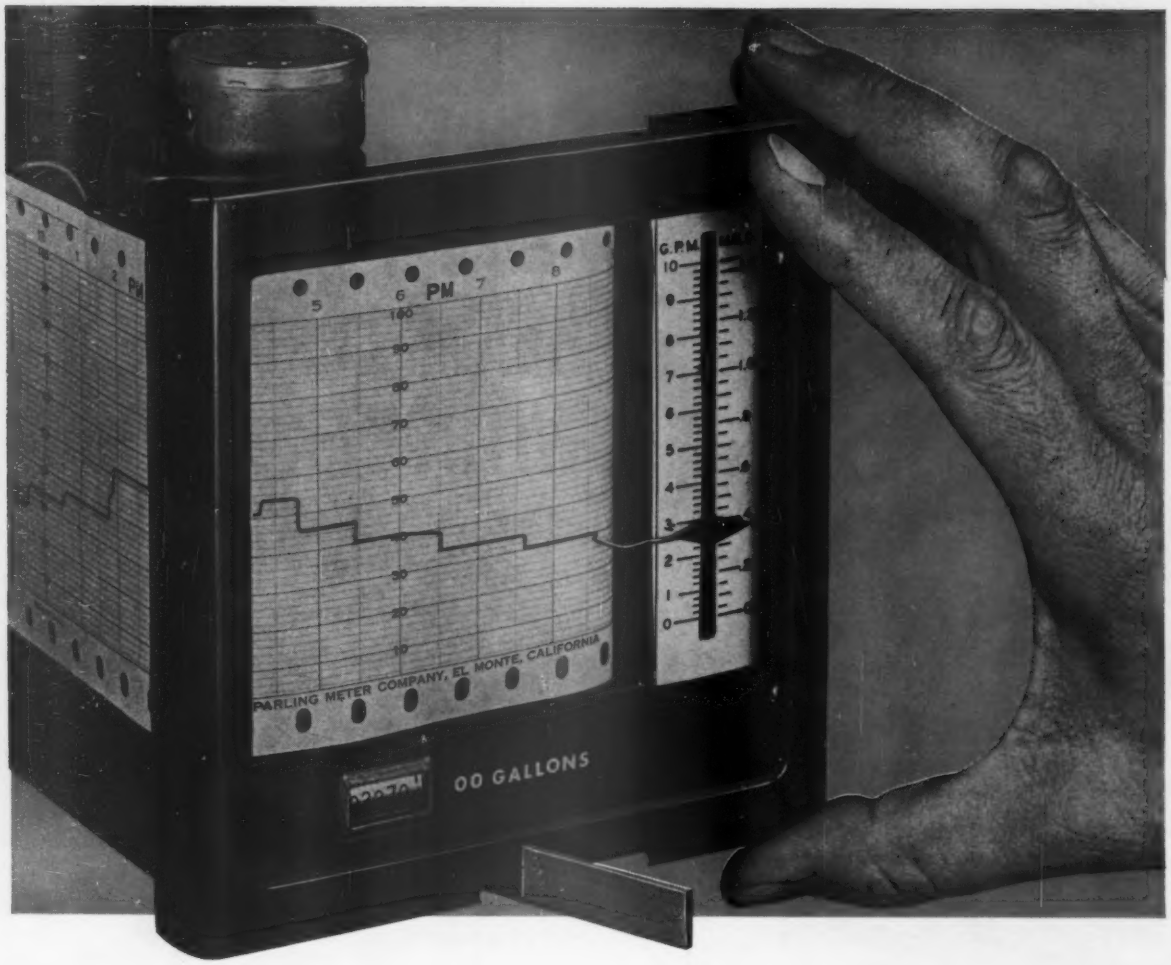
And it always delivers a full flow of water.

Advertising campaign from Cast Iron Pipe Research Association shoulders a heavy load, too!

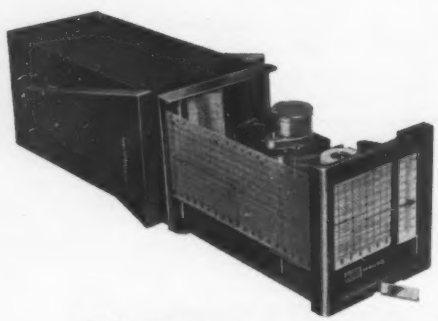
For years the Cast Iron Pipe Research Association has attacked the water problem nationally; now, in addition, it is undertaking a new campaign to combat this crisis on a local level. Car cards, speeches, radio spots, newspaper ads, mailing pieces—everything will be included. If your town's problem is apathy or a growing water shortage, we may be able to help. For complete details, write to the Cast Iron Pipe Research Association today!

CAST IRON PIPE RESEARCH ASSOCIATION,
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois

CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE



New SPARLING MINIATURE STRIP CHART INDICATOR • TOTALIZER • RECORDER



COMPLETE FLOW INFORMATION IN LESS THAN 1/4 PANEL SPACE

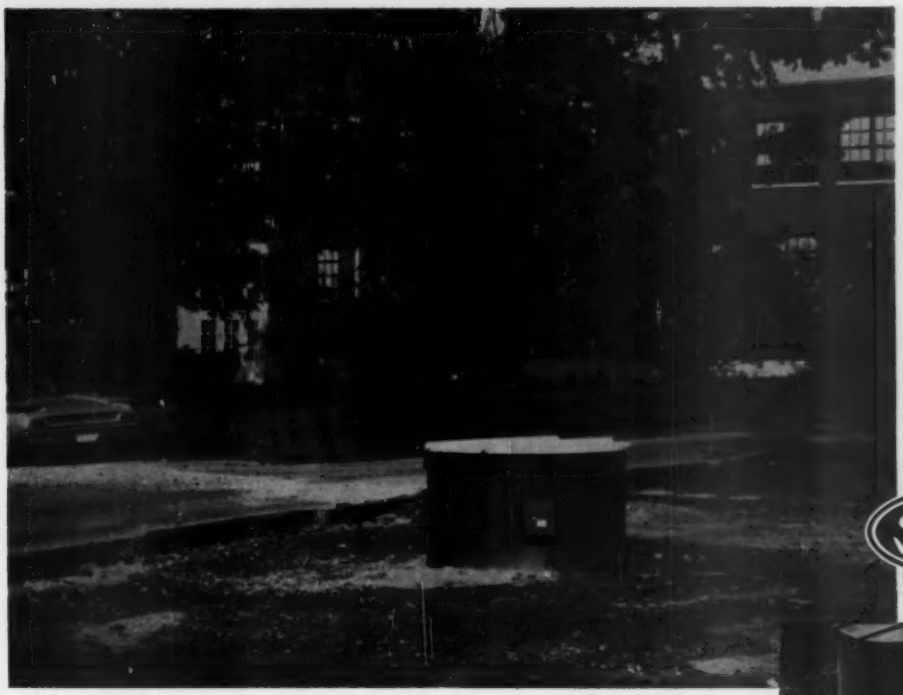
Indication, *totalization* and recording—the same as in full size instrumentation—are all provided in this new, compact unit. Uses standard components, yet requires little more than 6" square panel area. Has 6-digit totalizer, dual equivalent scales, and effective range of 20:1. 60 or 120 day records. When chassis is removed, 26 hours of records are visible without moving chart. Ideal for graphic or conventional panels, and standard electronic racks. WRITE FOR TECHNICAL BULLETIN CF-390.

Sparling equipment includes a complete line of instruments, controls and propeller meters for all main-line requirements.

SPARLING
WATER CONTROL EQUIPMENT

HERSEY-SPARLING
METER COMPANY
Sparling Equipment: **EL MONTE, CALIF.**
225 North Temple City Blvd.

Branches: Atlanta • Chicago • Cleveland • Dallas • Denver • Kansas City, Mo. • Roselle, N. J. • San Francisco • Seattle • United Kingdom Affiliate: TYLORS OF LONDON LTD.



S&L

Shively Ky.

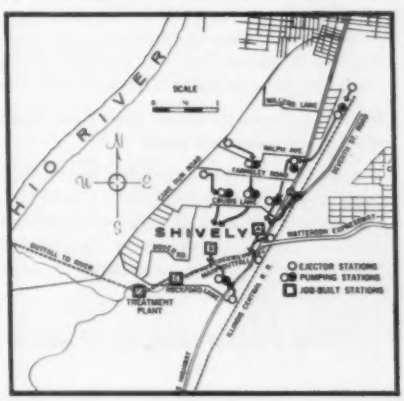
LOUISVILLE

Fourteen Smith & Loveless factory-built sewage lift stations are a part of the new municipal sewerage system in Shively, Kentucky. The project was engineered by J. Stephen Watkins and Robert E. Martin, consulting engineers of Louisville and Lexington, Ky. The stations were installed by Hy-Ty-Co, a joint venture of the R. B. Tyler Company of Louisville and Hyde Construction Co., Jackson, Miss.

Shively is the fastest-growing city in Kentucky and a suburb of Louisville. Its new sewer system will utilize eight Smith & Loveless pump stations—seven with elevators in the entrance tube—and six Smith & Loveless "Mon-O-Ject" pneumatic ejector lift stations.

The Shively stations are another vital link in our list of over 1,600 installations all across the United States, including Alaska and Hawaii, Canada—even Europe and South America. Built by the world's largest manufacturer of factory-built sewage lift stations for municipal sewerage systems.

For the complete story of Shively's municipal sewerage system—and engineering data on Smith & Loveless factory-built sewage lift stations and sewage treatment plants—**just write to Department 20.**

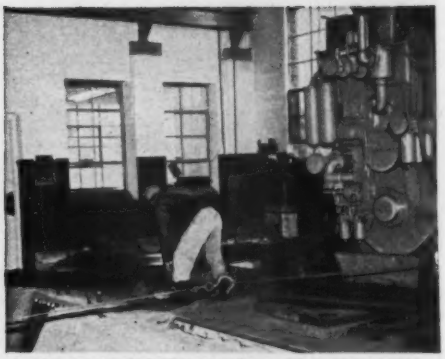


Smith & Loveless

ONE OF THE UNION TANK CAR COMPANIES

P. O. BOX 8884 / KANSAS CITY 15, MISSOURI / PLANT: LENEXA, KANSAS

(2832)



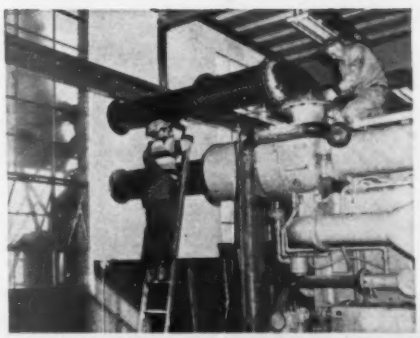
The Enterprise DGSQ Turbocharged Dual Fuel engine is moved into place as a unit. With 16" bore and 20" stroke, it is rated 1422 HP at a speed of only 360 RPM.

Fourth Enterprise Engine arrives at Belleville under protective wraps of all-weather tarpaulin. This new addition adds 1000 KW to plant's capacity.

Bright Power Picture at Belleville: Better Schools and Streets, with Lower Taxes!

"We recently installed the fourth Enterprise Engine in our 100% Enterprise Dual Fuel plant. Our excellent experience with this equipment over the past eight years has proved it to be our best buy in engines. Operating and maintenance costs have been consistently low, greatly reducing power costs and helping make Belleville one of the most thriving and progressive cities in the middle west. We have better schools and streets, lower taxes, above-average recreational facilities, and many other advantages enjoyed by only very few cities of similar size."

Earl E. Whitney, City Manager
Belleville, Kansas



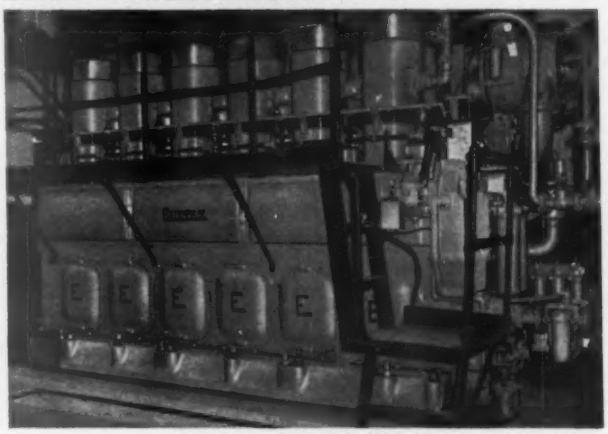
Installation nears completion as exhaust stack and muffler are installed. This "all Enterprise" plant, with its 2500 KW capacity, now has ample dependable reserve power for any emergency, future growth.

City managers, municipal engineers, superintendents — all those concerned with the growth, the future, the prosperity of their community, can look to Enterprise Engines confident they will get this same kind of dependable and economical power-generating performance.

Enterprise Engines — Diesel, Dual Fuel, Spark Ignited Gas — serve every municipal need

The most modern engineering advances are reflected in every Enterprise model, from 73 to 6933 HP, for stationary or portable electric service, flood or water pumping systems, sewage plant power. See the Enterprise sales engineer in your area, or contact us direct for information or help with your plans.

Over a million horsepower at work the world over!



New member of the all Enterprise power team is cut in on the line. Low maintenance cost, excellent service record, and over-all economy of the Enterprise engines already in use were the big factors in its selection.

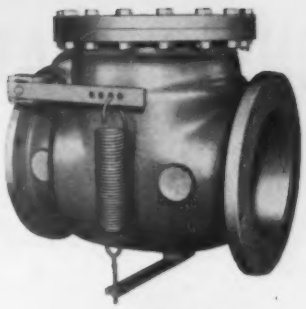
ENTERPRISE Diesels
THE DEPENDABLE

Enterprise Engine & Machinery Co., Subsidiary of General Metals Corporation
18th & Florida Streets, San Francisco 10, Calif. • National and worldwide sales and service.

EDDY New Improved Products Meet Modern Needs

EDDY Fire Hydrant

- **Improved, streamlined, modernized**
- **Optional break-flange**
- **Large diameter barrel**
- **New self-sealing main valve packing**
- **Requires no lubrication**
- **Opens *with* pressure**
- **Closes *against* pressure**
- **Underwriters' listed**
- **Standardized, interchangeable parts**

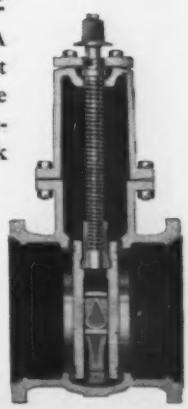


EDDY Check Valves

Completely new designs of horizontal swing check valves are available in sizes from 4 through 12 inches. They operate dependably in either vertical or horizontal positions and incorporate construction features which provide unusual flexibility of operation. These valves may be converted in the field from plain to single- or double-lever operation to meet changing requirements. Other check valves up to 24 inches.

EDDY Gate Valves

In addition to the regular line of EDDY Taper Seat AWWA gate valves, EDDY now offers a newly designed parallel seat AWWA gate valve in sizes through 12 inches. This valve has been specifically engineered to provide long, trouble-free service. Working parts are designed with heavy, thick section and large seating surfaces for dependable operation and improved wearing qualities. The valve has two-point, free-floating wedging for minimum friction and maximum operating ease. Other AWWA gate valves are available through 48 inches.



Whatever your waterworks requirements, it will pay you to have full information on the complete EDDY *line of valves and hydrants.*

EDDY VALVE COMPANY
A Subsidiary of James B. Clow & Sons, Inc.

WATERFORD NEW YORK

ARE YOU GIVING AWAY TONS OF WATER

...just to save a few cents?

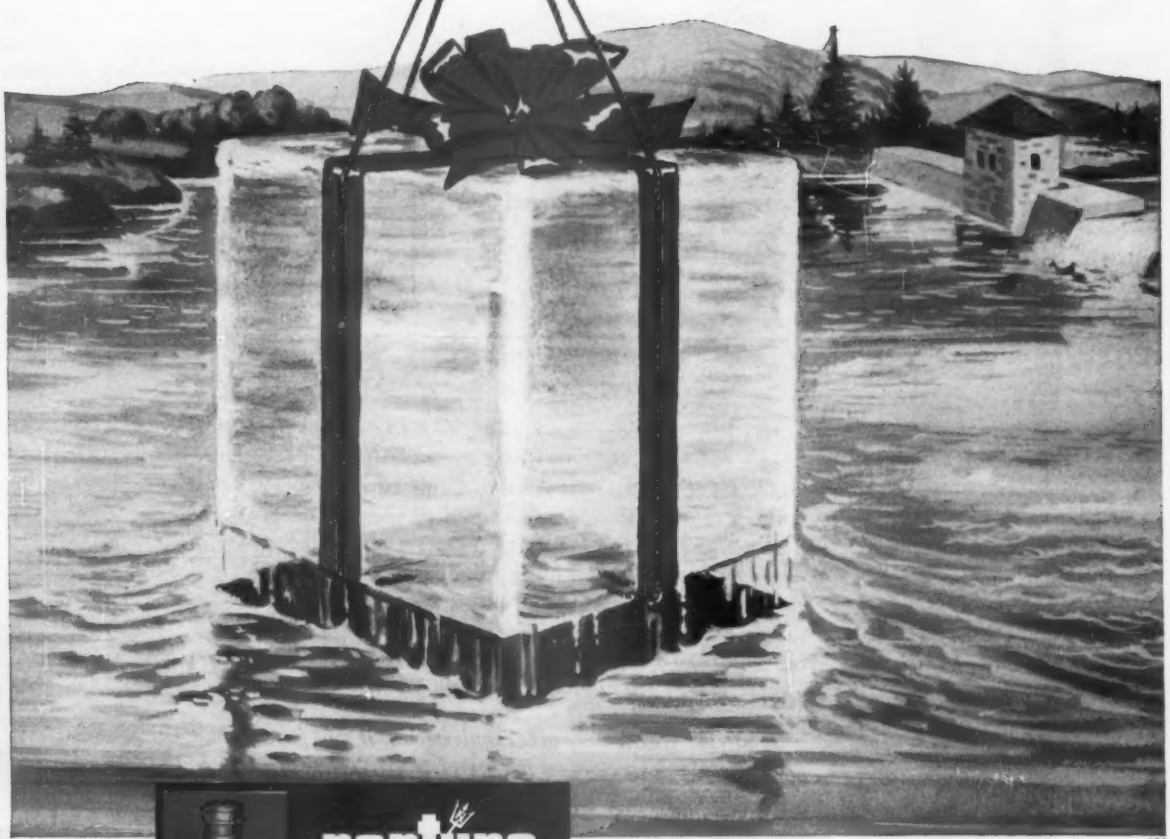
The value of a water meter is not what it costs, but what it *earns*. Actually, its "bid price" is only your down payment, and could well be the only *easy* payment.

There are two reasons. First, like any fine instrument, a water meter loses accuracy as it wears. After a few years... or a few months... it begins to lose revenue. If you buy on price alone, you may soon find the meter giving away far more than the few cents you thought you saved.

Secondly, to keep the meter accurate, you may have high repair costs... or premature scrap-and-replace programs. Different makes of meters vary widely in this respect.

Water is your city's most vital service. You entrust it to the accuracy of your meters. To be sure of this accuracy, visit your meter shop. Ask which meter gives highest sustained revenue... with lowest repair and depreciation costs.

We sincerely believe the answer will be "**Trident.**" 15,000,000 since 1898... the world's leader.



neptune
TRIDENT WATER METERS

NEPTUNE METER COMPANY
LIQUID METER DIVISION

47-25 34th St. Long Island City 1, N. Y. / Neptune Meters, Ltd., 1430 Lakeshore Rd., Toronto 14, Ont. / Offices in Principal Cities

Vol. 108, No. 1 • January 1961
WATER & SEWAGE WORKS
A Scranton Gillette Publication

W & SW presents its ANNUAL REVIEW of New Equipment, Plants, and Installations in 1960

USIFLEX® Boltless flexbile joint pipe. ▼

Photo Courtesy
United States Pipe & Foundry Co.

Photo Courtesy Yeomans Bros. Co.

▲ HI-CONE AERATORS at sewage treatment plant, Glendale, Ill.

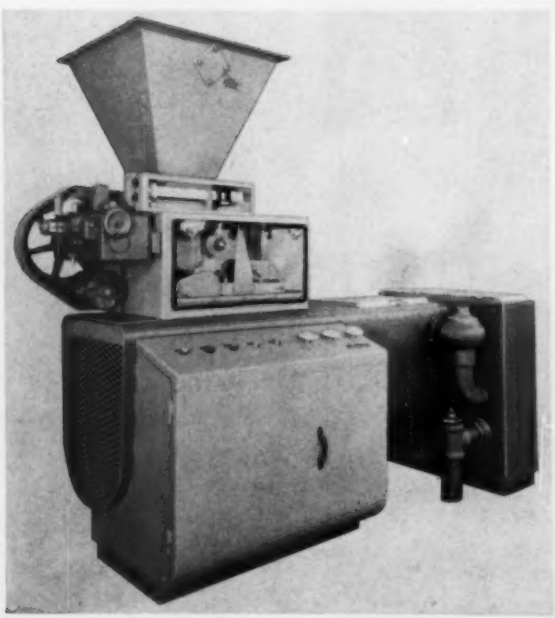


Photo Courtesy
Omega Machine Div.,
B-I-F Industries

◄ LIME SLAKER, Pug Mill Type.

▼ PORTABLE POWER VALVE Operator for opening and closing valves.

Photo Courtesy E. H. Wachs Co.

Photo Courtesy Symons Clamp & Mfg. Co.

FORMING of "Y" walls of a sewage treatment plant, Mansfield, Ohio. ►

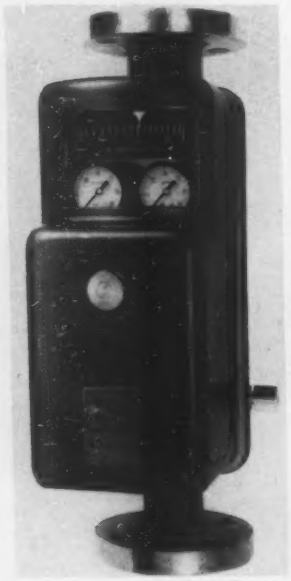


Photo Courtesy Brooks Instrument Co., Inc.

▲ ARMORED THROUGH-FLOW ROTAMETER with an indicating pneumatic flow transmitter.

Photo Courtesy Infilco Inc.

◄ ACCELO-BIOX® "total oxidation" plant Type A using atmospheric oxygen at a motel in Tucson, Ariz.

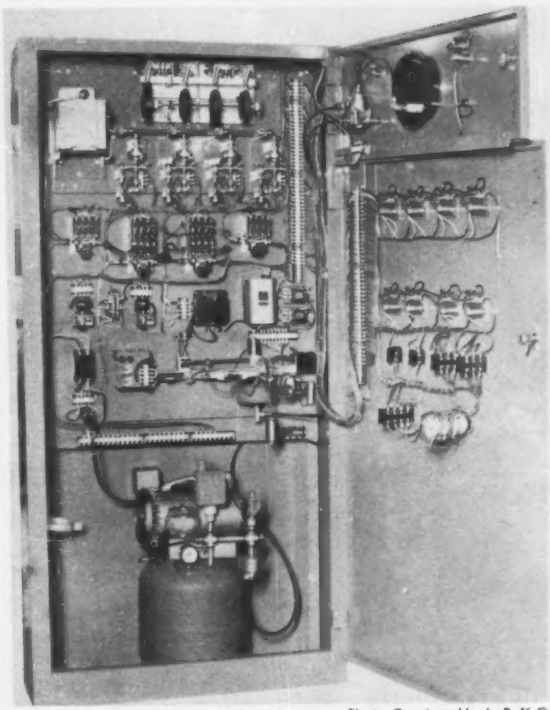


Photo Courtesy Healy-Ruff Co.

▲ CONTROL UNIT, Lower Section, for automatic operation of two constant speed and two variable speed pumps.

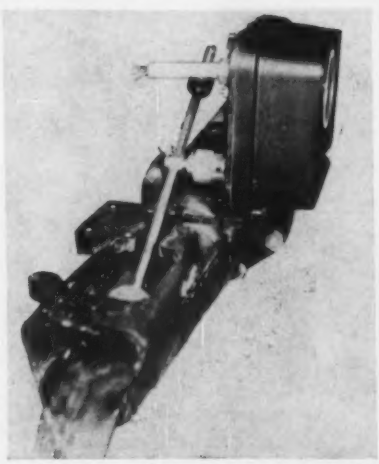


Photo Courtesy Simplex Valve & Meter Co.

FLOAT-IN-FLUME METER, showing ► transmitter and ball float.

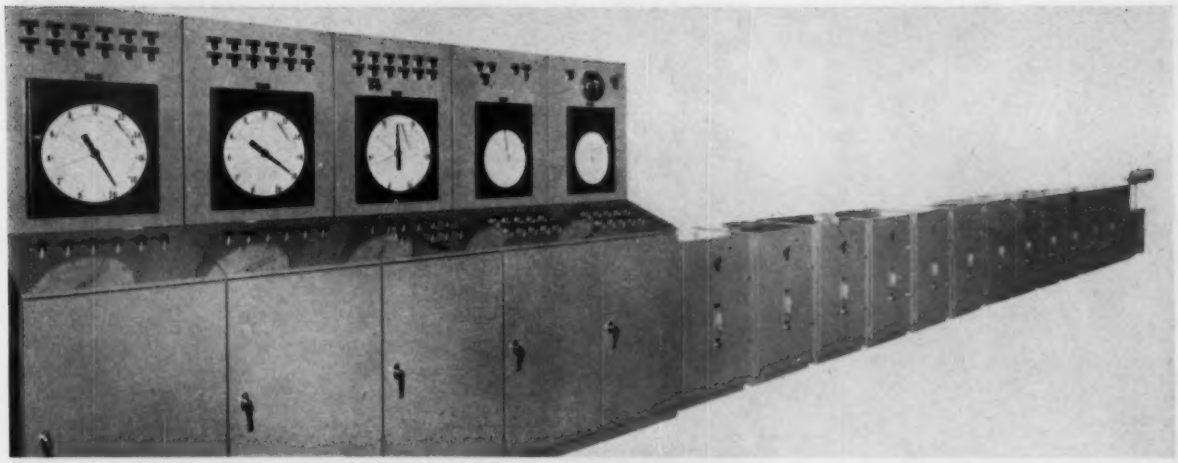


Photo Courtesy Automatic Control Co.

▲ **WATER SYSTEM CONTROL** involving pulse amplitude telemetering, including a number of highly sensitive individual control devices. (Seymour Johnson AFB).

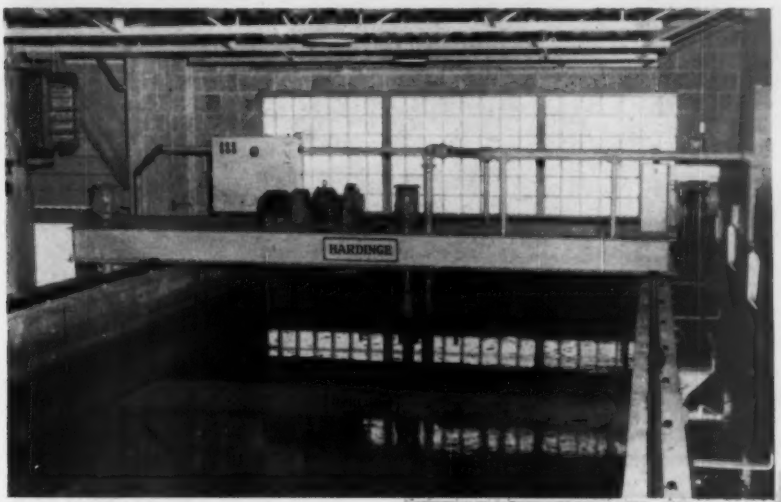


Photo Courtesy Hardinge Co.

FILTER PLANT INTERIOR at ▲ Cumberland Hill, R. I., shows automatic backwash equipped filter.

Photo Courtesy Keasbey and Mattison Co.

ASBESTOS-CEMENT SEWER PIPE installation at Simpson, Mich. ►

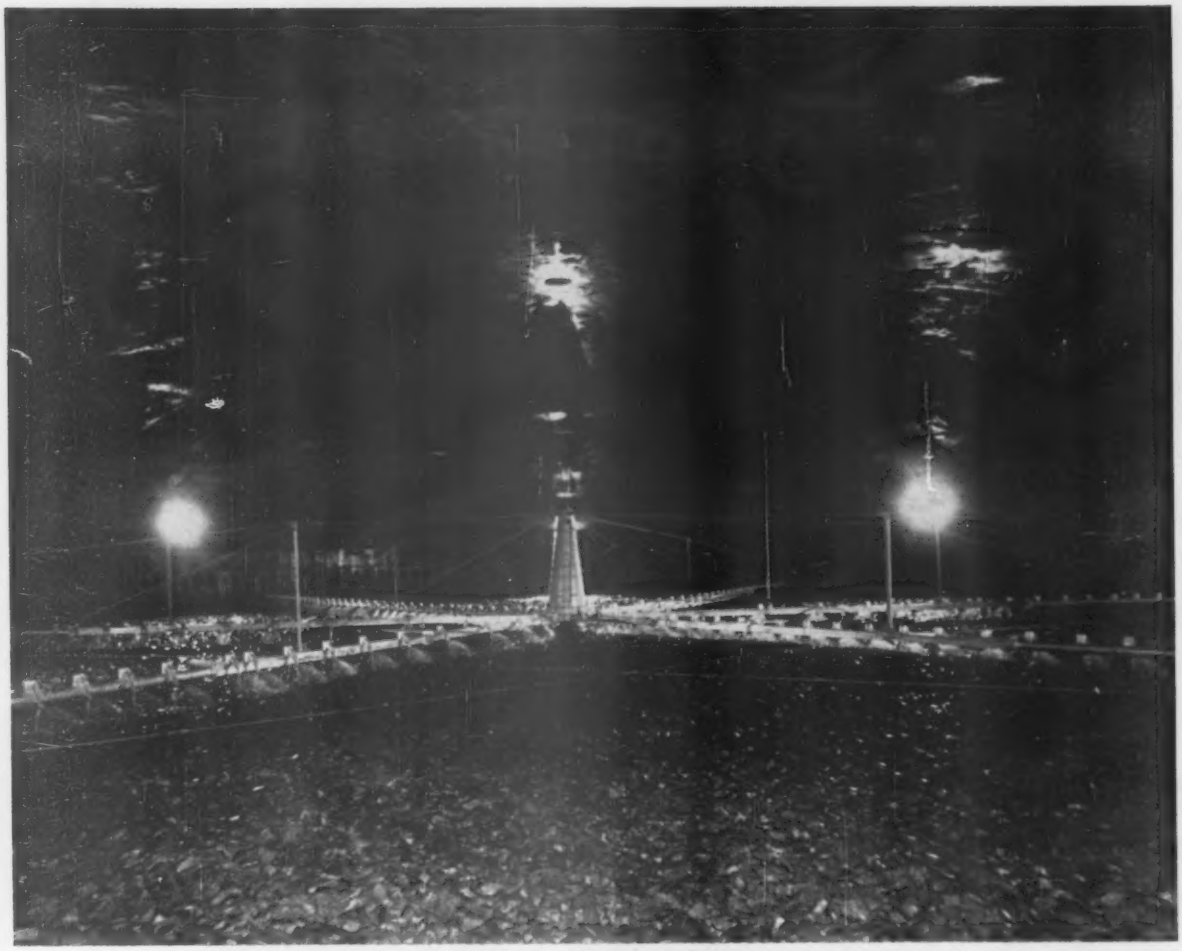


Photo Courtesy Chain Belt Co.

REX TOW-BRO ► SLUDGE REMOVERS installed at American Cyanamid Co.'s Bound Brook, N. J., plant.

Photo Courtesy General Filter Co.

▲ NEW TRICKLING FILTER at Milford, Iowa is 172 ft. dia.; it has six arms and is enclosed in one of the world's largest prestressed concrete domes.

PRESTRESSED CONCRETE STANDPIPE with a 2,950,00 gallon capacity is 122 ft high, 65 ft I.D., and has a 12 in. wall thickness.

▼ Photo Courtesy Preload Co., Inc.

Photo Courtesy Johns-Manville Corp.

▲ TRANSITE SEWER PIPE, New Brunswick, N. J., Metropolitan installation.

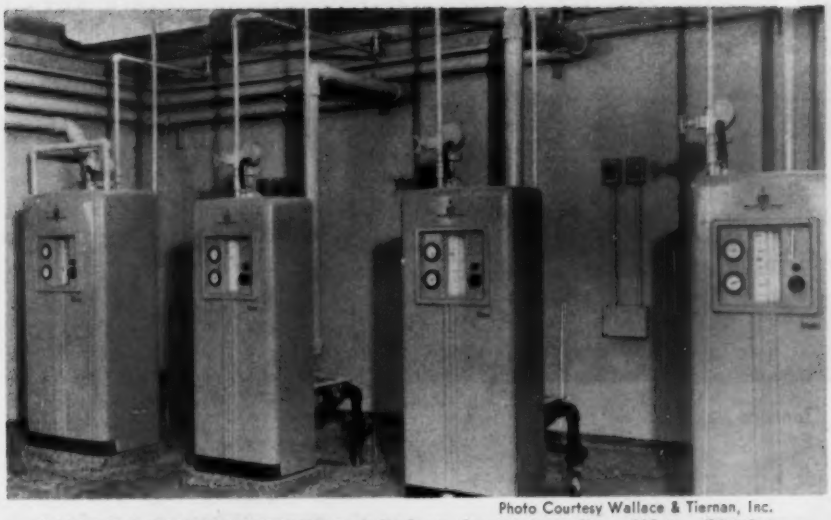


Photo Courtesy Wallace & Tiernan, Inc.

▲ V-NOTCH CHLORINATORS installed at the Metropolitan Water District Treatment Plant, Salt Lake City, Utah.

Photo Courtesy Lakeside Engr. Corp.

▲ COMPLETE TREATMENT PLANT with high rate trickling filters; primary and final 36 ft Spiraflos and high rate rotary distributor. Spencer, N. C., plant has design flow of .75 mgd.

Photo Courtesy Fischer & Porter Co.

CHLORINATOR, designed principally for municipal swimming pool applications, features integral chlorine gas pressure gauge. ▼

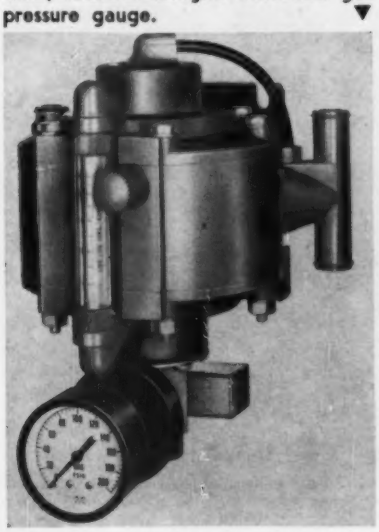


Photo Courtesy Mueller Co.

NEW CURB VALVE, the "Oriseal".

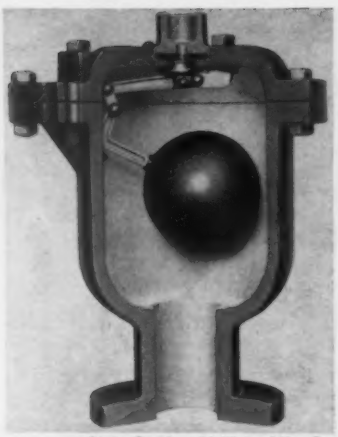


Photo Courtesy Multiplex Mfg. Co.

▲ PRESSURE AIR VALVE.

Photo Courtesy Bethlehem Steel Co.

90 in. ALL STEEL, WELDED PIPELINE. Recently completed installation connects St. Paul's, Minn., filter station with City's water source, Lake Vadnais. ►

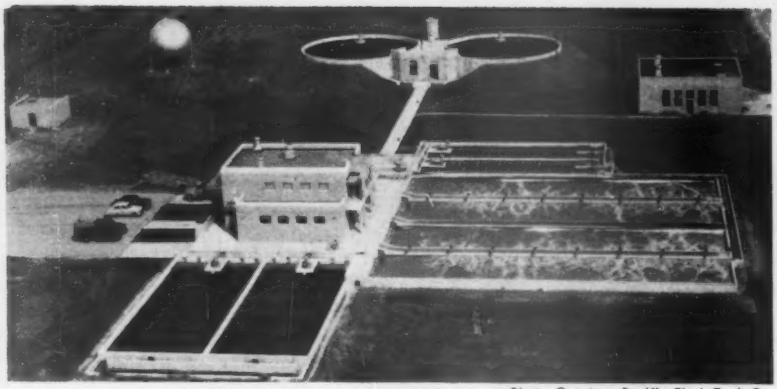


Photo Courtesy Pacific Flush Tank Co.

▲ SEWAGE TREATMENT PLANT, Connersville, Ind.

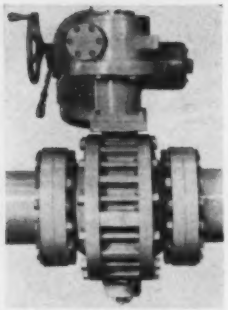


Photo Courtesy Henry Pratt Co.

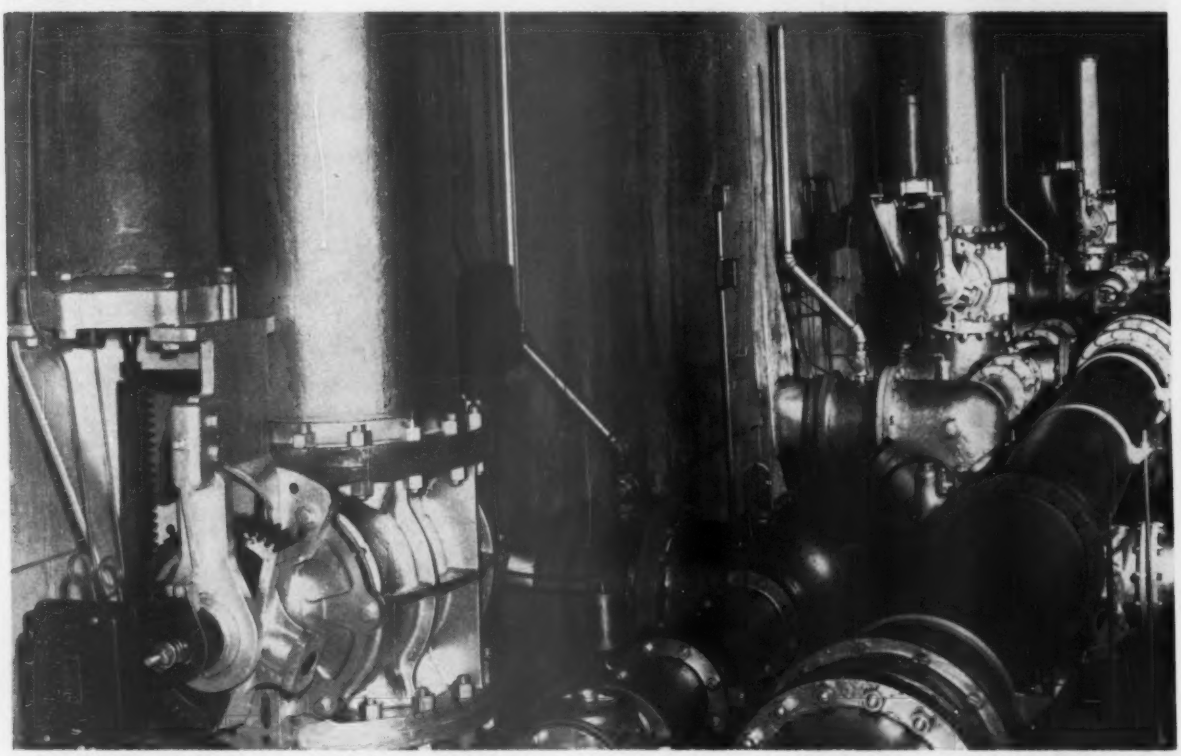
RUBBER SEAT BALL VALVE for off-on or throttling service in pipelines, dam or reservoir discharges, and control systems.

TOTAL FLOW METER, measures flow of sewage and wastes in open channels. ▼

Photo Courtesy Leupold & Stevens Instruments, Inc.

Photo Courtesy Eimco Corp.

▲ PRIMARY CLARIFIER, 220 ft dia. X 10 ft swd, for Trinity River Authority, Dallas County, Texas.



▲ ECCENTRIC VALVE, automatically controlled, Water Treatment Plant, St. Cloud, Minn. Photo Courtesy DeZurik Corp.

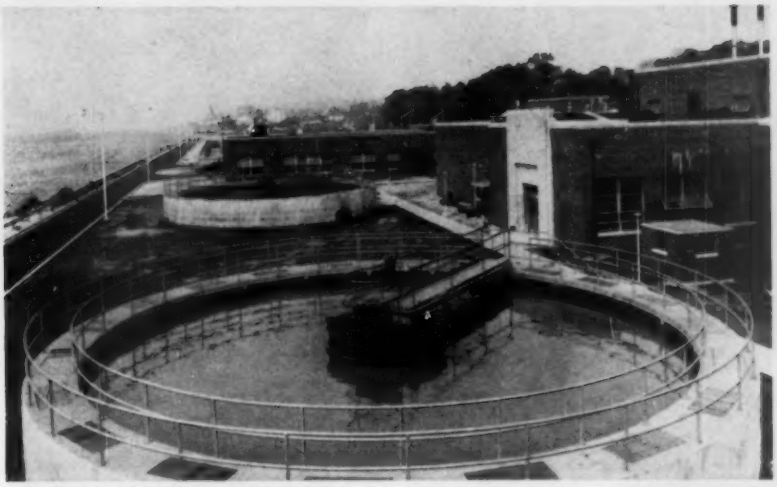


Photo Courtesy Walker Process Equipment, Inc.

▲ SLUDGE THICKNESS, 45 ft dia. with 8 ft 10 in. swd and 13 ft 10 in. cwd, recently added to Yonkers, Westchester County, N. Y., Sewage Treatment Plant.

Photo Courtesy Chicago Bridge & Iron Co.

▲ HORTON SPHEROIDAL STEEL TANK at Purdue University has a 1,500,000 gal. capacity.

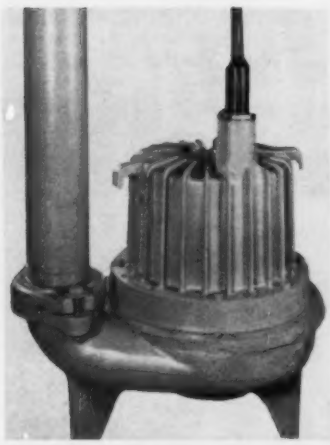


Photo Courtesy Weinman Pump Co.

◄ IMMERSIBLE, NON-CLOG, PUMP for handling sewage, drainage water and industrial wastes.

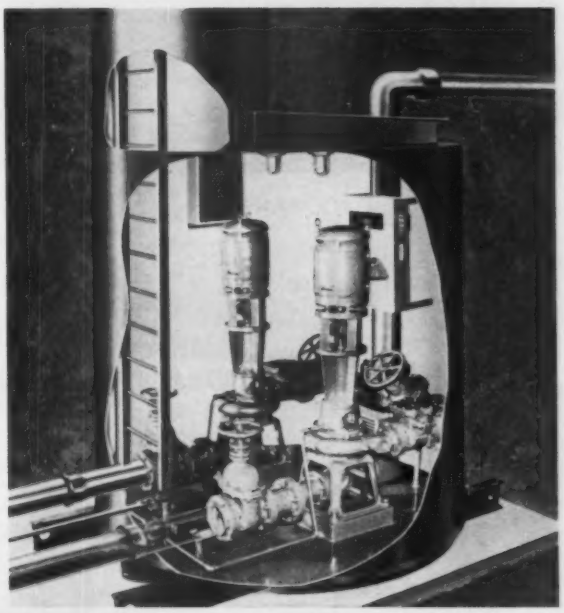


Photo Courtesy Tex-Vit Supply Co.

▲ PACKAGED PUMP STATION, Duplex Model.

Photo Courtesy Add-A-Phase, Div. of Systems Analyzer Corp.

▲ MULTI-MOTOR Power Converter permits the operation of 3-phase equipment from 1-phase lines.

Photo Courtesy Allis-Chalmers Mfg. Co.

◄ A 350 hp VERTICAL PUMP MOTOR in service in a New Mexico pumping station.

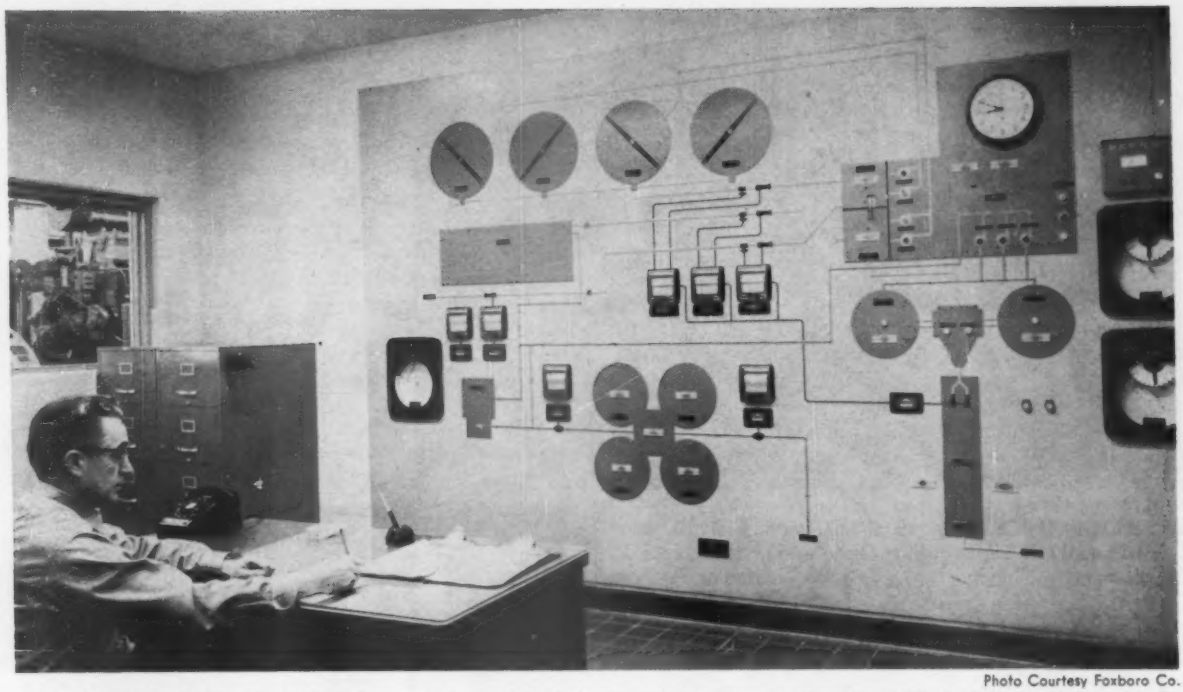


Photo Courtesy Foxboro Co.

▲ GRAPHIC CONTROL PANEL for central control of Archie Elledge Sewage Treatment Plant, Winston-Salem, N. C.

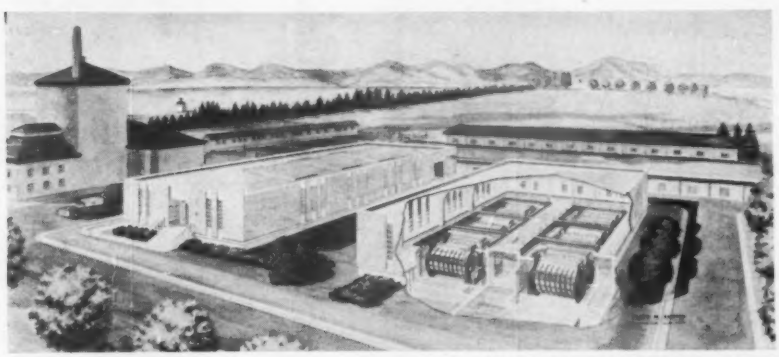


Photo Courtesy Glenfield & Kennedy, Inc.

▲ MICROSTRAINING, sole filtration plant to treat 120 mgd at Denver, Colo.

Photo Courtesy Wemco Div. of Western Machinery Co.

SIX TORQUE-FLOW PUMPS used to pump raw sludge to degritting section of El Paso, Texas Sewage Treatment Plant. ▼

Photo Courtesy B-I-F Industries

▲ COMPACT CHLORINIZER mizes chlorine gas with water and feeds the resulting solution.

Photo Courtesy Link-Belt Co.

TWO-STAGE Bio-filtration sewage treatment unit. ▼

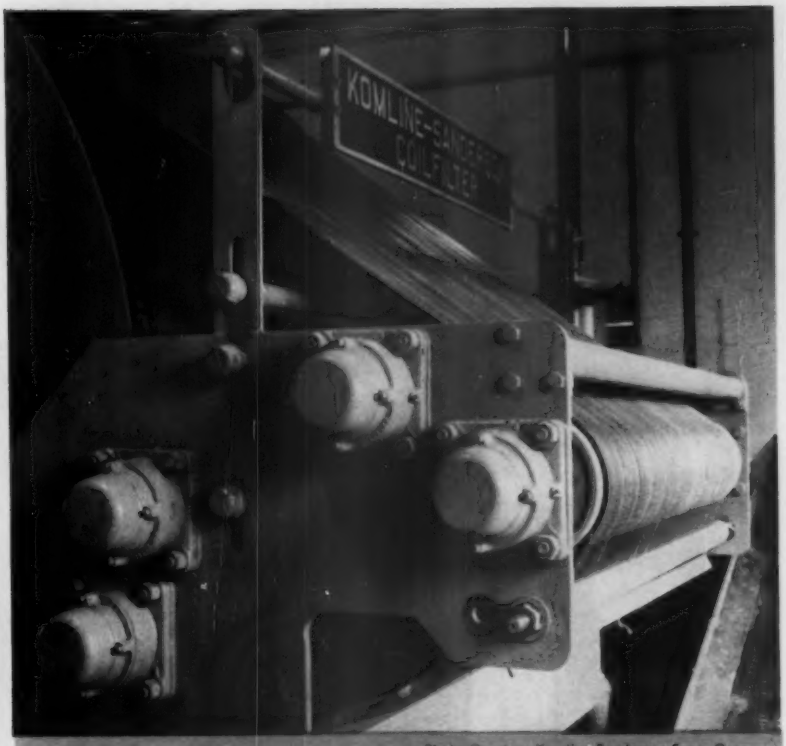


Photo Courtesy Komline-Sanderson Engr. Corp.

▲ COILFILTER installed at Joplin, Mo., Shoal Creek Plant.

Photo Courtesy General Chemical Div., Allied Chemical Corp.

▲ NEW ALUM PLANT at El Segundo, Calif.

Photo Courtesy Permutit Co., Div. Pfaudler Permutit, Inc.

PERMAERATOR installed in a sewage disposal plant. ▼

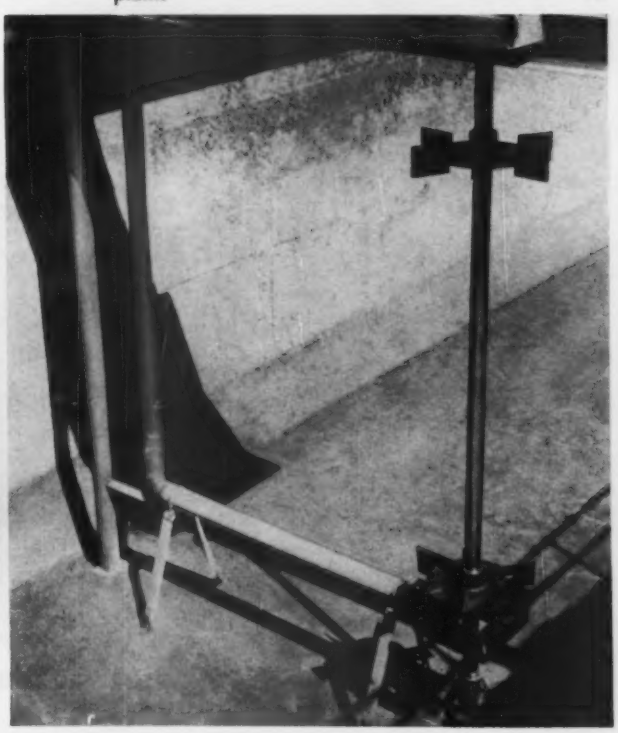


Photo Courtesy Airkem, Inc.

◄ **ODOR CONTROL VAPORIZER eliminating odors from high rate trickling filter.**

Photo Courtesy Hagan Chemicals & Controls, Inc.

CHEMONITOR provides for the continuous on-stream analysis of water and effluents. ▼

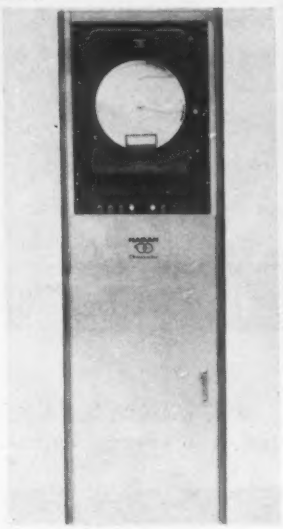


Photo Courtesy Cleveland Trencher Co.

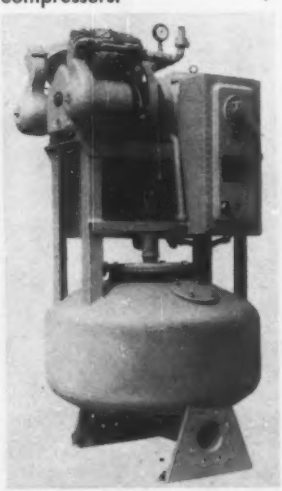
▲ **TRENCHER digging a waterline trench flush at the outside edge of the berm.**

Photo Courtesy Proportioneers Div., B-I-F Industries

▲ **CHEMICAL PUMP for controlled feeding of chemical solutions, acids and alkalies.**

Photo Courtesy Ralph B. Carter Co.

PNEUMATIC EJECTORS are available as single or duplex units and with reciprocating or rotary type compressors. ▼



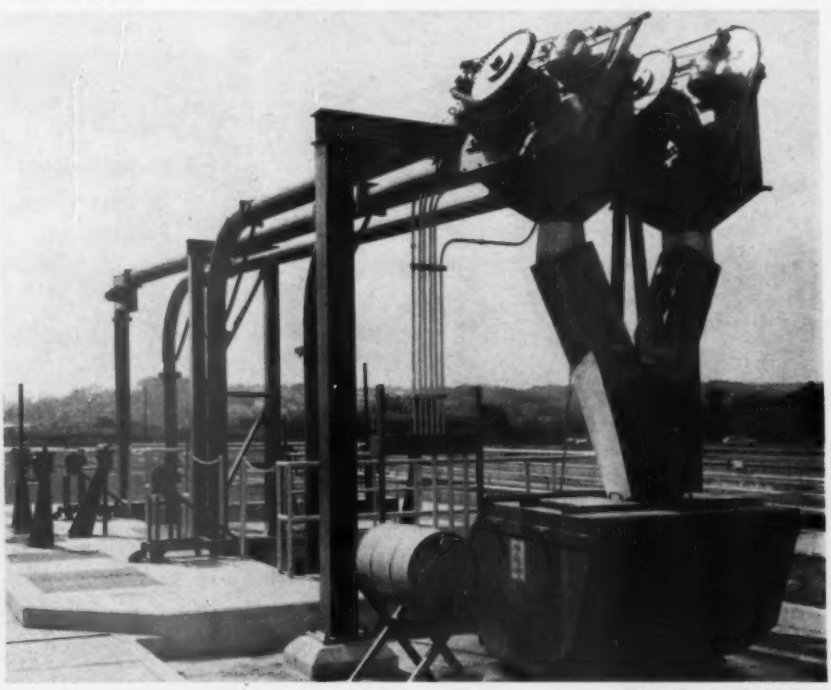


Photo Courtesy Stuart Corp.

▲ **CONVEYOR HANDLES SEWAGE GRIT at Arlington County, Va., Sewage Treatment Plant.**

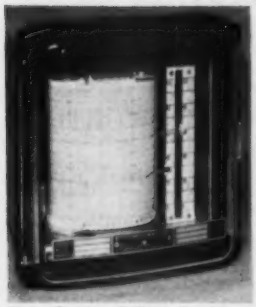


Photo Courtesy Builders Providence Div., B-I-F Industries

▲ **COMPACT STRIP CHART Indicator two-pen recorder.**

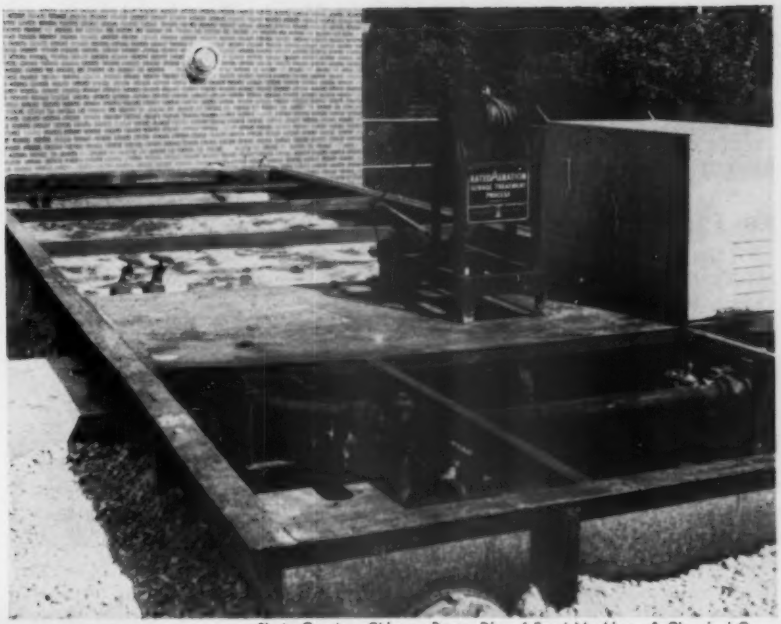


Photo Courtesy Chicago Pump, Div. of Food Machinery & Chemical Corp.

▲ **RATED AERATON, 15,000 gpd rectangular steel sewage treatment plant installed at an Indianapolis, Ind., elementary school.**

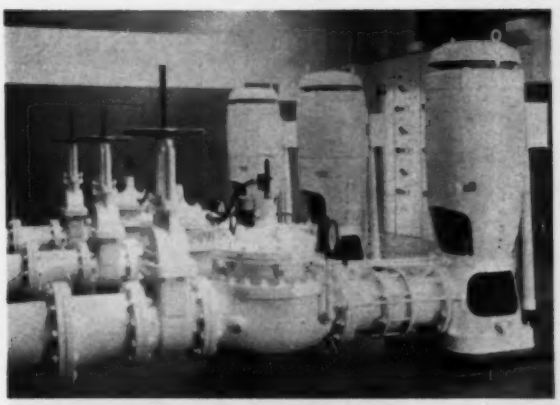


Photo Courtesy U. S. Electric Motors, Inc.

◄ **UNIBASE MOTORS in booster service at the Fullerton, Calif., Municipal Water System La Palma Pump Station.**

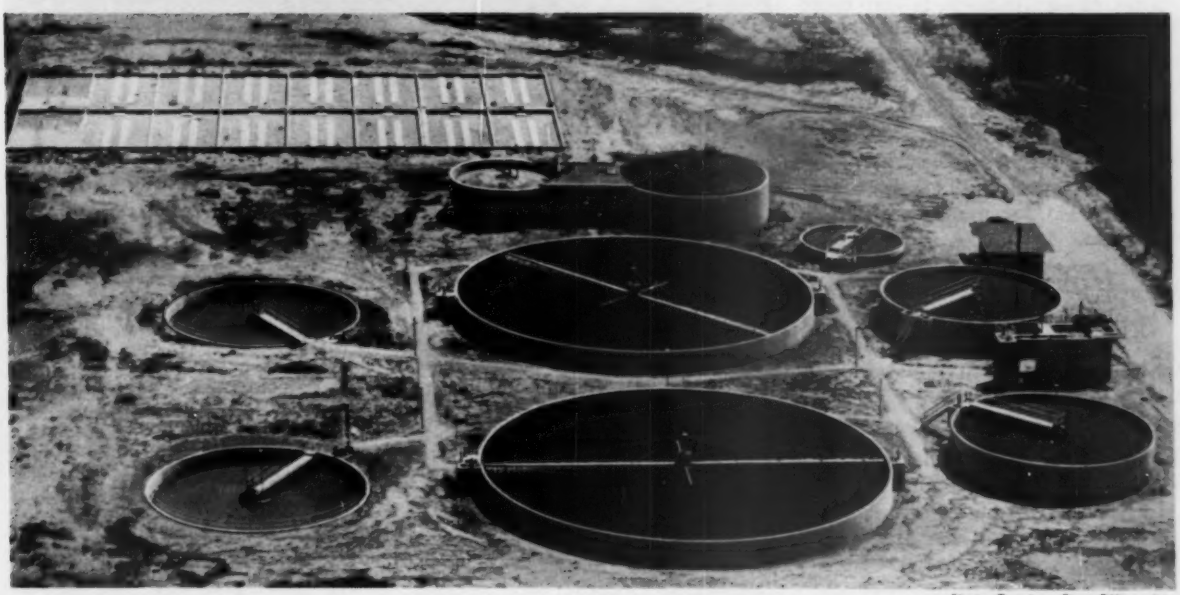


Photo Courtesy Dorr-Oliver, Inc.

BIO-FILTRATION PLANT at Harlingen, Texas, treats wastes from nearby fruit and vegetable canning plants as well as domestic sewage.

More than 1700 attended the thirty-third annual meeting . . .

Water Pollution Control Federation

by V. W. LANGWORTHY,
Editor
WATER & SEWAGE WORKS

EDITOR'S NOTE: Held in Philadelphia, Pa., October 2-6, the Federation's annual meeting covered an enormous amount of technical ground. Papers of special interest to the domestic wastewater industry are reported here. Industrial wastewater reports will be included in the January-February issue of *Industrial Water and Wastes.*

Special Sessions

■ THE HONORABLE Arthur S. Flemming, Secretary, U. S. Department of Health, Education and welfare, spoke out at the annual Federation Luncheon about the public administrator's responsibility in demonstrating technical and problem-solving skill and in understanding the subject matter in assigned areas. The WPCF must move forward, locate fundamental knowledge and reach agreement on techniques, methods and procedures to be used. He is convinced the water pollution problem can be solved and opportunities for constructive service exist.

The Secretary pointed out that industry has not failed to take action within times set by pollution abatement notices. The same cannot be said for municipalities, he said, referring to St. Joseph, Mo., where voters have not authorized the City to proceed. He said Congress has been asked to strengthen enforcement provisions of existing pollution abatement legislation in these areas:

Where pollution affects navigable interstate streams, whether or not interstate pollution exists, when a state asks for it.
When a governor, or state water pollution agency asks for Federal help, mechanism has been requested to permit municipalities to initiate remedial procedures to clarify and strengthen HEW Secretary's role.
Provide appeal within 60 days in U. S. Court of Appeals.

Secretary Flemming also believes the Federal government's role must be supplemented as follows:

Collect and disseminate information
Carry forward and accelerate research
Continue the successful construction grant program
Train reasearch people
Authorization to abate interstate water pollution.

He re-emphasized the importance of improved enforcement provisions which would: permit

COLORFUL COSTUMES were worn by men and women of the host committee. Here are (L to R) Stan Kappe, Al Astrada, and Sam Baxter, with other localites in the background.

calling of conferences which might be fruitful; permit having hearings where recommendations can be presented; produce notices and serve them on industry and cities. Finally, civil action jurisdiction relative to enforcement would be vested in U. S. District Courts.

Featured speaker at the annual Industry Luncheon was Robert G. Dunlop, President, Sun Oil Company, Philadelphia, who described "Enlightened Self-Interest: Guideline to Water Conservation." This thesis has provided the oil industry with sound conservation and pollution control measures. Former wasteful oil drilling and storage methods have been replaced by industry-stimulated state conservation laws and a 25-year old interstate oil compact. Using sound technical knowledge, the petroleum industry has established bases for proper, economically attainable standards. The result has been successful pollution control and water conservation programs.

The Federation has the opportunity to provide knowledge, leadership, and cooperative programs for efficient use and protection of water resources. In spite of honest differences of opinion on how best to achieve overall objectives, water pollution is a local problem. As such, the guideline for solution is sound, cooperative local action based on enlightened self-interest.

"Determination of Radioactive Substances" was discussed by Lloyd R. Setter, A. S. Goldin, and H. L. Krieger, all from the Robert C. Taft Sanitary Engineering Center, Cincinnati, Ohio. The eleventh edition of Standard Methods for the Examination of Water and Wastewater contains a new section on Radiological Methods. The authors outlined these methods and presented reasons for choices of procedure and instruments. Method advantages and limitations were pointed out. The paper was a feature of the Laboratory Scientists Breakfast.

Federation Awards

WPCF Awards presented during the Philadelphia meeting included the following:

George Bradley Gascoigne medal to C. D. Parker, Chief Chemist and Bacteriologist; H. L. Jones, Chemist; and N. C. Grune, Assistant Chemist, all of Melbourne and Metropolitan Board of Works Research Laboratory, Melbourne, Australia. Parker was present to receive the award which recognized him and his associates as authors of the valuable paper, "Performance of Large Sewage Lagoons at Melbourne, Australia". The paper appeared in the February, 1959, Jour. SIWA.

Harrison Prescott Eddy Medal to Professor P. H. McGauhey, Director of the Sanitary Engineering Research Laboratory and Professor of Sanitary Engineering, University of California, Berkeley. Professor McGauhey received the award in recognition of his detergent studies and other contributions to the knowledge of wastewater treatment principles and processes.

WPCF PRESIDENT for 1961 is Ray E. Lawrence, Partner, Black and Veatch, Consulting Engineers, Kansas City, Missouri.

Harrison Prescott Eddy Medal also was awarded to Stephen A. Klein, Chemist, Sanitary Engineering Research Laboratory staff, University of California, Berkeley. Mr. Klein is project chemist engaged in detergent studies sponsored by the American Association of Soap and Glycerine Producers.

Charles Alvin Emerson Medal to Federick H. Waring, Chief Engineer, Ohio State Department of Health, Columbus, Ohio. The award recognizes his interest in Federation membership advancement and other outstanding services.

Industrial Wastes Medal to Thomas W. Beak, Consulting Biologist, Kingston, Ontario; Dr. Norman E. Cooke, Principal Chemical Engineer; and Claude de Courval, Mathematical Statistician, both of Canadian Industries, Ltd., Montreal, Quebec. The award noted their outstanding paper, "Pollution Monitoring and Prevention by Use of Bivariate Control Charts", published in December, 1959, Jour. SIWA.

General Technical Session

Comprehensive Survey of the Water Resources of the Delaware River Basin was presented by Colonel T. H. Setliffe, District Engineer, U. S. Army Engineer District, Philadelphia, Pa. Congress authorized a water resource survey of the Delaware River Basin in a series of resolutions between 1950 and 1958. They required the U. S. Army's Corps of Engineers to make the study and project the needs of the Delaware River Basin for fifty years, with a look forward to the following fifty years. They were to study all aspects of water use, consider the economic aspects of each facet of the plan, and recommend a plan of development best suited to meet the needs. Twenty-one million people live in the area that can be serviced by water from the Basin. The area represents 1 per cent of the continental U. S., 13 per cent of the Nation's population, and generates 17 per cent of the National personal income. It is expected that the population and employment will double during the next fifty years, and personal income will increase over four times the present level. The study indicates the need of flood control, water supply, recreation and hydroelectric power. The recommended plan will provide for 11 major water control projects, 8 sites initially for recreation, later for water supply use, and 39 subbasin development projects.

Where Do the States Stand in Water Pollution Control? A paper presented by Curtiss M. Everts, Chief, Sanitation and Engineering, Oregon State Board of Health, Portland, Ore. Water pollution

control is progressing. Significant reductions in pollution loads have been made in nearly every state. While old problems are being overcome, new ones are being created at a rate often beyond the present capacity of state or interstate agencies to solve them. Crowded water-based sports areas, careless use of pesticides, non-biological contaminants, radioactivity, sewage disposal for unincorporated urban areas, and current sewage treatment process limitation form a new combination of tasks for water pollution control agencies. A survey of selected metropolitan newspaper editors indicates faster action is necessary. The editors list requirements for increased appropriations for investigative personnel, better public understanding of the problem and simplified financing of sewerage works as chief deficiencies at present. In general, there is a feeling that there are enough laws at present. Given sufficient staff and support, the objectives of the water pollution control program can be accomplished.

Where Does Research Stand in Water Pollution Control? by H. G. Hanson, Director, Robert A. Taft Sanitary Engineering Center, Cincinnati, Ohio. The present status of pollution control research was described by Hanson who indicated that 95 agencies were engaged in research in 1958. He pointed out that the current resources available for research lie in the origin and behavior of wastes, waste treatment, effluent disposal, stream monitoring and survey, treatment of water, and conservation. Two hundred and eighty projects are being investigated in these areas. Among the resources available for research are academic institutions and sanitary engineering centers. While the number of people engaged in this type of research in the U. S. is small, (218 persons), Hanson encouraged a reversal of this trend. There is a need to increase our accountability for all of the wastes reaching our streams. This would include water from land drainage and compounds applied for direct chemical reaction. While difficult, it is possible to predict pollutional character of new wastes. A well-equipped and well-staffed laboratory is needed and procedures are expensive and time consuming. Increased attention has required a means to reduce BOD Many polluting compounds do not exert BOD. Indications are that we must depend less and less on the receiving stream to treat wastes; it may be that theories on mixing and the mixing capacity of the stream are not being adequately used. Stream monitoring is needed to provide data on which to proceed toward an understanding of what ought to be done about wastes. Instruments currently available do not meet the need and a lack of progress is readily apparent. Treatment of water for reuse is possible, but proposes problems; for example, in the separation of liquids and solids. The techniques used in the future will be based on presently known but little used procedures and techniques. Methods will be developed to use these in control laboratories of future treatment plants.

Where Does Industry Stand in Water Pollution Control? was presented by A. J. Steffen, Wilson & Co., Chicago, Illinois. Steffen is also chairman of the National Technical Task Committee on Industrial Wastes. The importance of recognizing "beneficial stream use in the overall public interest" when defining pollution was emphasized. There is no benefit derived by unnecessary waste discharge restrictions. Not all uses of surface waters can be evaluated in dollars, and stream quality considerations must necessarily recognize economic values to be equitable and reasonable. Results of a survey sent to pollution control administrators and individuals in the industrial waste field in 39 states based on treatment provided and treatment needed were evaluated. Data from 26 states indicate municipal treatment facilities increased 74.5 per cent and industrial waste treatment facilities increased 64 per cent during the past ten years. Needs of municipalities decreased 36.5 per cent, and industries showed a similar decrease of 44 per cent in the ten year period. This indicates a gain in pollution control and a trend toward consolidation of small plants and a movement of industries into cities, either by annexation or new plant construction. He also indicated industrial waste research advances. The most important trend is industrial leadership recognition that disposing of waste is part of the production job. Another important step was the organization in 1950 of the National Task Committee on Industrial Wastes which assists the PHS on industrial waste matters and facilitates the exchange of information.

WPCF VICE-PRESIDENT Harry E. Schlenz, President, Pacific Flush Tank Co., Chicago, Illinois.

Public Relations

Public Relations is A Day-to-Day Job claimed C. F. Wertz, Miami, Florida, President, American Water Works Association. The Miami Department of Water and Sewers recognizes the importance of public relations and tries to create, through good day-to-day service, a sympathetic public. In addition to good service, it is necessary to keep the people informed. Civic groups and visiting travelers are taken through the City's new sewage treatment plant. Plant employees wear uniforms purchased by the Water and Sewer Department, and this has improved morale and on-the-job sanitation. The employees selected the uniform colors which are white for operating personnel, and green for the maintenance staff. Vacuum-filtered, digested sludge is available to the public for use as fertilizer resulting in a cartage cost saving and has increased friends for the department. Odor control is treated as a public re-

lations activity and includes work at the pumping stations to provide good neighbors. Ozone, plus activated carbon, is used in these locations. Water and sewage charges are billed jointly but noted separately on the statement. Letters to users explain how, where, and when connections are to be made, and a similar procedure is used to explain methods of financing department operations. A full-time staff answers telephone inquiries, often totaling 1,000 calls per day. The staff is kept abreast of developments and can usually settle complaints directly.

Public Relations—Thoughts Plus Action Equals Results was presented by J. E. Meers, Superintendent, Sanitary District of Bloom Township, Chicago Heights, Illinois. Public relations can be termed a combination of education, service, useful information, action and words, backed by deeds. A public relations program will develop an interest in people to understand community sanitary facilities. The interested and well-informed public will approve needed projects more readily than an uninformed group. In 1952, sanitary district officials presented a bond issue for $1.6 million for sewage treatment plant improvements. The election was preceded with half-hearted attempts to publicize the issue, and the officials were ill-advised about the facts and needs. The result was that the issue lost by a four-to-one majority. A new approach to the problem involved improved public relations and an educational program. Within 18 months following defeat, a bond issue for $1.7 million was passed. It was reported that success of the effort resulted from self-evaluation, an engineering study and survey, formation of a citizens' committee, determination of how the project would be financed, a pre-election campaign before civic and veterans' clubs, and use of radio, newspapers, and direct mail. Slides were used to exhibit samples of good and bad public relations communications material.

Better Understanding of Water Pollution—A Challenge proposed by Robert F. Orth, Johns-Manville Corporation, New York, N. Y. The public must be awakened from its slumber and alerted to the proposition that water pollution can be stemmed only through installation of adequate treatment facilities. The sooner the job is attacked with determination, the better. The individual citizen must be made to understand the facts regarding water pollution, whether it affects his town or the village up or downstream from him. Each citizen must understand that pollution directly affects his life, that of his children, and his neighbor. A united front is now being presented by the AWWA, Water and Sewage Works Manufacturers Association public relations program, the National Water Institute, and the Water Pollution Control Federation's public information activities. The future health of the country will no longer be a cause for concern if hard work is done at local, state, and national levels now. The way to do this work is to not omit an opportunity to speak about the health and prosperity that modern water utility and disposal systems provide to every community.

Public Relations Aspect of Promoting a Bond Issue by Ted Sperling, Metropolitan St. Louis Sewer District, St. Louis, Mo. The agencies responsible for wastewater and water supply treatment in the U. S. face an enormous task. The task is enormous because of the size of the job to be done and voter apathy toward the need. In order to succeed, public opinion must be marshalled in individual communities to make the money available to accomplish the objective. The job is more difficult because of the strenuous struggle for the public tax dollar, educational needs provide an example. Procedures were outlined illustrating how bond issues can be placed before voters effectively in order to obtain the required funds.

Maintenance Forums

Mechanical Maintenance—Large and Small Treatment Plants was discussed by R. C. Thayer, Director of Operations for the Hampton Roads Sanitation District Commission, Norfolk, Va. He pointed out the necessity of maintaining equipment in view of high costs and demands for funds available from the public.

Operating Experiences at Whitemarsh, Pa., Refuse and Sewage Incinerator by Bertram B. Reilly, Dravo, Corporation, Pittsburgh, Pa. The incinerator described was designed to burn dewatered sludge in addition to municipal refuse. Clarified effluent from the treatment plant is used for cooling purposes. Design loads are 12 tons per hour of mixed refuse and ½ ton per hour of dewatered sludge. Non-combustibles and ash residue are quenched and removed to overhead bunkers by a flight conveyor, while the combustion gases are drawn through a scrubber and discharged through short stacks to the atmosphere. The quench tank serves as a settling chamber for water used in scrubbing the stack gases. Design advantages are low manpower requirements, air and water pollution control, slag-resistant furnace operation, and attractive, low silhouette building construction.

Operation and Maintenance of Incinerator Furnaces was described by R. D. Leary, Milwaukee Metropolitan Sewerage Commission, Milwaukee, Wis. Operation of the Milwaukee activated sludge plant and waste collection problems were reviewed. Disposal of the wastes by incineration have advanced since 1925 to the present. A fully automatic multiple-hearth incinerator has now been installed. He described the loading variations which permit incinerator operation without use of auxiliary oil or gas fuel. He indicated that labor, overhead, and retirement benefits comprise nearly 86 per cent of the total incinerator operating costs.

Recent Investigations of Overflows from Combined Sewers in Washington, D. C. was reported by George J. Moorehead, Chief of Planning Branch, District Building, Washington, D. C. A study was initiated in 1958 designed to produce a defensible engineering estimate of that percentage of sanitary sewage flow in the District of Columbia, which is lost to the adjoining rivers and streams. The paper presented a brief history of

the circumstances and events leading up to the project and described the project in general. The findings were set forth, together with remedies proposed. A discussion of Moorehead's paper was presented by C. Frank Johnson, Metcalf & Eddy, Boston, Mass. The investigation was concerned primarily with the frequency, duration, and amount of rate of flow of the overflows. Automatic recording gauges provided data from important overflow points. Made in two phases, the study covered one year of gauge records ending in February, 1957, and the second phase extended from December, 1958, and includes, thus far, three years of gauge records. The first phase resulted in the selection of dilution factors used for devising a comprehensive program of sewer improvements. The second phase produced an engineering estimate of the quantity of sewage overflowing to the streams. This information was used in studying, developing and selling the comprehensive program of improvements.

Sewer and Catch Basin Cleaning was discussed by Edward Kowsz, Bureau of Public Works, Metropolitan District, Hartford, Conn. This was a 30-minute, 16mm motion picture useful in acquainting people with methods and machines used to keep a wastewater system running. Color film was used to illustrate how over 400 miles of sewers are cleaned and maintained by the Bureau. Actual emergency stoppages were filmed and the removal methods depicted. Views of catch basins being cleaned during storm and dry weather conditions were included and also illustrate the latest type of equipment available. The film also deals with underground investigation and equipment used to test the sewers for dangerous gases. Air packs, gas masks, harnesses, helmets, and lights were also depicted.

HEW SECRETARY Arthur S. Flemming, right, and USPSS Asst. Surgeon General Mark D. Hollis, immediate WPCF Past-President.

Ammonia Nitrogen and the Anaerobic Environment was presented by Orris E. Albertson, Dorr-Oliver, Inc., Stamford, Conn. Sludge digestion has been improved by physical environment control at or near the optimum point for biological activity. However, sludge thickening has greatly increased the activity level resulting in large changes in the biochemical equilibrium. Digestive thickened sludges are characterized by high alkalinities (ammonia nitrogen) and a well-buffered pH. Some researchers have blamed ammonia toxicity for failure under these conditions. A laboratory scale digestion study was instituted to establish what toxic or inhibitory effect existed, at what level and by what mechanism it influenced the biochemical equilibrium. Four temperature-controlled, continuously mixed laboratory digesters were used. Normal digestion control tests and ammonia nitrogen concentration were determined daily. Results showed that ammonia nitrogen ion was not toxic, nor did it directly inhibit biological activity. However, high ammonia nitrogen concentration increases the pH and directly affects the methane bacteria metabolism rate. This results in an increase in volatile acids, which neutralize the pH back to a more optimum level. Thereafter, further increase in ammonia nitrogen causes volatile acid to exceed the inhibitory level of 2500-3000 mg/l. The ammonia concentration affecting biochemical equilibruim is inversely proportional to digester loading. The digester environment can be described by an empirical equation having four variables.

The Effect of Copper on the Activated Sludge Process of Sewage Treatment by G. N. McDermott, W. Allan Moore, Mildred A. Post, J. W. Mandia, and M. B. Ettinger, all of the Robert A. Taft Sanitary Engineering Center, U. S. Public Health Service, Cincinnati, Ohio. Duplicate activated sludge treatment plants of 100 gpd capacity were used to experimentally study the maximum level of copper in sewage and industrial wastes mixtures which can be tolerated without reducing biological treatment process efficiency. The effect of

the copper was measured by differences in treatment efficiency between the plants as shown by BOD, COD, and solids analysis. The primary and excess activated sludges were fed into anaerobic digesters where the effect of the metal on digestion was measured by differences in gas production. Experiments included continuous addition of copper and short time slug doses. The fate of the copper and its distribution among the primary sludge, activated sludge, and final effluent was determined in each case.

Quantitative and Qualitative Shock Loading of Activated Sludge Systems was discussed by Anthony F. Gaudy, Jr. and Richard S. Engelbrecht, both of University of Illinois, Urbana, Illinois. Two major types of shock loads were studied. In the quantitative shock load, the system is subjected to a rapid increase or decrease in organic compound concentration after being previously acclimated. In the qualitative shock load, a non-toxic change in the chemical structure of the substrate or waste undergoing stabilization is involved. Important changes in waste structure may occur in certain industrial waste treatment systems and may be important in considering the joint treatment of municipal and industrial wastes.

The Effect of Physical and Chemical Agents on Oxygen Absorption by W. Wesley Eckenfelder and Edwin Barnhart, both of Manhattan College, New York, N. Y. The physical agents, such as temperature and viscosity, and surface active chemical agents influence the absorption of oxygen from air bubbles in water. The agents influence both the liquid film coefficient and the interfacial area for transfer. The size of the air bubble released from a diffuser and the diffusion characteristics of oxygen into the solution are influenced by the addition of organic substances to water. Transfer rate will be influenced by temperature variations. The effects of physical and chemical agents may be correlated to pertinent variables and compared to results obtained in water. The correlations developed can be extended to the evaluation of commercial aeration systems.

Trafalgar Township Sewage Treatment Plant described by John G. Powell, Gore & Storrie, Ltd., Toronto, Ontario, Canada. Trafalgar Township lies between Metropolitan Toronto and Hamilton, Ontario. Since the close of World War II, this general area has been one of Canada's most rapidly expanding industrial centers. Trafalgar specifically commenced growing in 1952 when the Ford Motor Company of Canada established a major assembly plant in the vicinity. The township comprises an area of 106 square miles immediately adjacent to Lake Ontario. Population has increased from 7,000 in 1952 to 30,000 in 1960. The assessment during this period rose from $10½ million to $63 million. The wastewater treatment plant is located in the center of a 32-acre wooded site near the lakeshore. The region also includes private residences. An activated sludge treatment plant, rated at one mgd includes bar screens, hand cleaning grit tanks, primary settling tanks, aeration tanks, and final settling tanks. Effluent is chlorinated and discharges through a 30 in. outlet pipe, 800 ft long, into Lake Ontario. Single stage digestion is provided and digested sludge is trucked to farms in the vicinity for final disposal. Extensions are now underway to increase the capacity to 2.5 mgd.

Small Plants in Metropolitan Seattle was discussed by Frank J. Kersnar, Metropolitan Engineers, Seattle, Wash. In general, the most satisfactory and economic solution of the sewerage problem of a metropolitan area is achieved when sewage from the entire area is delivered to a single point or to relatively few points for treatment. Topographic conditions in Seattle, however, are such that delivery of sewage from a small area bordering Puget Sound to the large, central systems is both difficult and expensive. The Comprehensive Sewerage Plan adopted in May of 1958 by the Municipality of Metropolitan Seattle calls for provision of seven small primary treatment plants on the shores of Puget Sound. Two are now in operation and two are in various stages of design. The area which will be served by the seven small plants is 36,000 acres, or 10 per cent of the total contained in the Metropolitan service area. Individual areas to be served vary from 3,000 to 7,520 acres. Design capacity of the plants varies from 3.5 mgd to 7.5 mgd. Two major sewage treatment systems provide service for 90 per cent of the area.

Observations on Small Sewage Treatment Plant Designs was presented by LeRoy Van Kleech, Bowe, Albertson & Associates, New York, N. Y. Van Kleeck defined a small treatment plant as one treating less than 1 mgd or serving a population less than 10,000 persons. The plant should be constructed only after a thorough preliminary survey. Untried processes should be avoided and the plant should be flexible to provide expansion. In a small plant instrumentation should be minimized. The number of man-hours for operation depends on the plant purpose. The flow should be checked accurately and may be 30 to 300 gpcd in a small plant. It was suggested that engineers should not scale down conventional designs expecting that they should be suitable for small installations. Package plants have three drawbacks in that they lack flexibility, depend on external power, and require operating attention, according to Van Kleeck. He provided examples of design features desirable in individual units. Avoid submerged pumps; in sewage pump installations, use dry wells. Watch velocity through grit chambers and retain a length-to-width ratio in settling tanks of 7:1 regardless of influent suspended solids. Outlet weirs and skimmers should have a baffle and raw primary sludge removal should be provided by a direct plunger pump suction connection. Avoid gravity sludge removal. Provide accessible and unobstructed sludge hoppers. Do not neglect the possibility of using Imhoff tanks. Septic tanks can be designed efficiently for up to 1,000 people and may be used in parallel to provide seven to eight hours detention. He suggested the use of large manholes in digester tank tops, and provision for access to

the inside of the tank near the bottom. Use dial indicating gauges for temperature reading. Do not use high-rate digesters. Provide for sludge sampling and include a meter for digester gas. Provide pre-chlorination for trickling filters and consider recirculation for low rate filters. He also suggested use of schematic diagrams of appropriate piping showing valves and connections. Also prepare an operating manual on tools and safety equipment. Finally, maintain a continuing interest in plant operation, one of the best ways to become aware of design errors.

Design of Small Sewage Treatment Plants was presented by W. E. Hoxworth, Partner, Hoxworth, Behnke, and Girard Associates, Haddonfield, N. J. He pointed out the necessity of maintaining high quality construction standards in sewage treatment plants for small communities. Attention should be paid specifically to soil conditions. Also consider the fact that modern appliance use is on the increase. A site should be chosen carefully with consideration being paid to future growth requirements. Possible disposal of property when the plant has outlived its usefulness should be considered. Warn potential neighbors about the proposed use of the site and do not underdesign the treatment facilities.

The Anaerobic Contact Process was described by Edwin B. Fall, District Chemist, and L. S. Kraus, Manager, both of the Greater Peoria Sanitary District, Peoria, Ill. This process was developed at the Robert A. Taft Sanitary Engineering Center for wastewater treatment in suburban areas. Studies indicate excel'ent removal of suspended solids and substantial BOD removal by passing sewage through a blanket of anaerobic sludge. Tank volumes required are of the same order as used in the Imhoff tank, and BOD efficiency and suspended solids removal were substantially higher. Accordingly, a proposed Imhoff tank in a Peoria area subdivision was modified so that the Anaerobic Contact Process could be used. Average efficiencies for the first twenty months of operation are 34 per cent BOD removal and 77 per cent suspended solids removal. The tank was designed with a displacement period of 26.3 hours at an 87.5 gpd influent rate. After twenty months, the retention period had reduced to 13.4 hours with no suspended solids efficiency drop. Dry solids accumulation in the sludge blanket amounted to 4.8 lbs per capita per month, and sludge depth was allowed to vary between 3 and 10 ft giving a storage capacity of 16.3 months at design load. The tank is followed by a dosing tank and trickling filter, in turn followed by a small oxidation pond from which effluent is discharged to a re'atively dry creek during the summer months.

Microbiological Aspects of Sewage Lagoon Operations as described by C. D. Parker, Lucey R. Alford, H. L. Jones, and A. D. Beer, all associated with the Research Laboratories, Melbourne and Metropolitan Board of Works, Melbourne, Victoria, Australia. Preoccupation with BOD removal in lagoon operation frequently leads to overlooking the microbiological quality of the effluent. The investigation proposed to establish quantitative relationships between lagoon design and operation variables, reduction in bacterial pollution indices and the nature and numbers of the algal population of lagoon effluents. Studies also examined the microbiochemical mechanisms involved in sewage purification in lagoons. The lagoons were located in the Melbourne area and have been previously described (*Jour. SIWA* for February, 1959). It was found that *coliform* and *enterococcus* reduction is small in anaerobic lagoons, greater in single cell aerobic installations but considerably higher in multiple cell aerobic lagoons and lagoons following high rate trickling filters. Proper design and operation produces effluents with counts approaching drinking water standards. Low level algal populations in effluents can be obtained by variation in lagoon layout and retain high BOD removals. Microbiological studies clarify the role of sulfur bacteria, nitrifying and denitrifying bacteria and a range of algal species in the mechanism of purification in lagoons.

SUN OIL COMPANY PRESIDENT, Robert G. Dunlop, spoke at the annual Industry Luncheon.

Pittsburgh Sewage Disposal Project—Construction and Operation was described by John F. Laboon, Allegheny County Sanitary Authority, Pittsburgh, Pa. The project includes a 150 mgd sewage treatment plant, a main pumping station, three local pumping stations, three local lift stations and 69 miles of intercepting sewers. These connect 321 sewer outfalls serving various municipalities and 30.5 miles of intercepting sewers are in tunnels. The maximum inside diameter is 126 inches. Tunnels are lined with precast concrete pipe in 16 ft lengths, equipped with steel end rings and rubber gaskets for watertightness. Concrete is used for back filling. Smaller sewers are made up of machine-made concrete pipe, clay pipe, and asbestos cement pipe. The main pumping station is located at the treatment plant and includes a wet well 117 ft deep and 94 ft inside diameter. In addition, the plant includes bar screens, four aerated grit chambers, a magnetic sewage flow meter, two 45-minute detention preaeration tanks, six rectangular sedimentation

tanks with aerated influent channels, four primary sludge pumping stations, five heat exchangers, ten sludge concentration tanks, four sludge incinerators, ash lagoons, three blowers, chlorination and administration and maintenance buildings.

The plant's novel feature is the method of concentrating primary sludge to an average of 18 per cent solids by the flotation process. The primary sludge is disintegrated prior to heating to 95°F and then pumped to concentration tanks where it remains for five days. The subnatant is then drawn off and returned to the raw sewage channels ahead of the grit chambers. The concentrated sludge is pumped to the incinerators. The incinerators operate at 1450°F to provide odor-free stack gases. Temperatures lower than this are insufficient to destroy incineration odors. The project was financed by a $100 million revenue bond paid from sewage charges based on water consumption.

Effectiveness of the Interception of Sewage-Storm Water Mixtures was presented by Walter G. Shifrin, and W. W. Horner, Horner and Shifrin, St. Louis, Mo. A study was made to determine the amount of storm and storm water runoff from combined sewers which should be intercepted for treatment to abate pollution of the Mississippi River. Occasional discharges of raw sewage mixed with storm water runoff could be tolerated due to available dilution of the Mississippi River. A study of rainfall and runoff was made with particular emphasis on runoff resulting from light rainfall. St. Louis was chosen as the study area and an abnormally wet year - 1957 - was chosen as the period of study. Weather Bureau hourly precipitation data were tabulated and corresponding runoff was estimated. Three interceptor sewer sizes were selected and the effectiveness of each was evaluated. The capacities of these interceptors equalled the peak dry weather sewage flow (135 per cent of average), 175 per cent of the average flow, and twice the average dry weather flow. The study concluded that selection of interceptor capacity in excess of the peak dry weather flow rate could not be justified. A larger capacity provided an insignificantly small increase in pollution abatement effectiveness at a significant increase in the initial cost.

Gamma Radiation Control of Raw Sludge Pumping—A paper prepared by C. O. Badgett, Industrial Nucleonics Corporation, Columbus, Ohio. A shortening of past and present means of determining per cent solids in raw sludge and activated sludge draw-off were discussed. Gamma radiation composition analyzer gives instantaneous results permitting accurate objective control of total solids in the process stream. The instrumentation and automatic control of such a system was described pointing out the advantages gained over an extended operating period. He explained the use of cesium 137 having a 33 year half-life as installed at Columbus, Ohio's sewage treatment plant. The control works automatically through a hand-off-automatic switch and two timers, one controlling flushing water and one cycling raw sludge removal from the sludge holding tank. Solids are maintained in the range between 8-10 per cent.

Criteria For Evaluating Deep Trickling Filter Performance was described by F. J. Burgess, C. M. Gilmour, Fred Merryfield, and J. K. Carswell, all of Oregon State College, Corvallis, Ore. Use of trickling filters to handle organic wastes has become standard practice and performance has been reported. Efficiencies have been reported in terms of 5-day 20°C BOD. Such information has served as a basis of various formulations of standards in current use by engineers for treatment facility design. Waste flow, strength, recirculation ratios, filter volume and per cent removal of 5-day BOD are the general parameters expressed in most such formulations and standards. Filter depth, media shape and size, porosity, time of contact, waste treatability and removal of total organic matter have not been fully described and have received less attention than BOD loading. Since BOD is a rate function dependent upon time and available biological food supply, it has been described by the conventional monomolecular equation. The rate constant "K" is a sewage characteristic function. Since the rate constant "K" is a function of sewage characteristics and temperature, and the 5-day BOD test itself is subject to errors of dilution and interferences, many engineers question its reliability as a single criterion for evaluating treatment efficiency. Also, the time involved in the test generally makes determination of the nitrification stage or long term BOD impractical. However, the ease of determination, familiarity of scientists and engineers with the test, and its similarity to actual treatment processes has made the 5-day BOD test a popular and useful tool. Both carbon and nitrogen transformations are important in judging treatment efficiency. The question of reliability of a single test or combination of tests, therefore, is of importance. The authors reported results of organic material removals obtained in a 20 ft deep trickling filter using various evaluating tests. Emphasis was placed on the reliability of the persulfate soluble carbon test as compared to the standard BOD analysis.

Operators Forum

Equipment Maintenance by Plant Personnel and Outside Personnel by E. Huntley DeLano, Superintendent, Sewage Treatment Plant, Grand Rapids, Mich. It was proposed that all treatment plant instruments be serviced by one service engineer, as opposed to having several service representatives call on the plant separately. The parts required for servicing would be furnished by the servicing agency because parts are often interchangeable between instruments furnished by different manufacturers. Maintenance training schools should be taken advantage of and are well worth the effort and cost involved. Some plants contract locally for window washing, painting, and other maintenance work, which relieves operating personnel of these auxiliary duties.

Disposal of Screenings and Scum was discussed by George Martin,

Superintendent, Green Bay Metropolitan Sewer District, Green Bay, Wis. The operation of a gas-fired incinerator to burn material collected on bar screens was described. The operation proved to be clumsy and dirty and was replaced with a shredder. Dumping of shredded materials into the sewage flow plugged sedimentation basin valves so this technique was also abandoned. Disposal of screenings to a dumping area, along with grit was unsatisfactory. The City eventually built an incinerator across from the sewage treatment plant and screenings were disposed of in this manner. Installation of bank boards in clarifiers improved the previously unsatisfactory procedure. Centrifugal pumps proved unsuitable for handling scum because grease began accumulating due to a local packing plant, and the increased use of domestic garbage disposal units. Gas recirculation devices assisted in destroying digester accumulations. Too much water was pumped with grease, and this cooled the digesters excessively. Grease is now pumped to a lagoon area and has been satisfactory for five years. Grease is removed from piping with "go-devils" and cable-operated pipe cleaners.

The Repair and Replacement Parts System was described by A. C. Bryan, Superintendent, Sewage Treatment Plant, Houston, Texas. The repair parts discussion during the Detroit, Michigan, Federation meeting in 1958 resulted in a Board of Control decision to appoint a committee. It was directed to study courses of action which would improve maintainability of plant equipment. For example, information is needed to identify bearing replacement parts, also parts lists for all equipment need clarification. The difficulty of pump impeller removal was described and gland material needs to be of more rugged construction. Improved communications are definitely needed between the user of the equipment, the designer, and the consulting engineer.

Flow Meters, Gas, Liquid, and Air was discussed by Anton E. Sparr, Superintendent, Upper Potomac River Commission Waste Treatment Plant, Westernport, Maryland. Popular, older metering units include the positive displacement gas meter, the venturi tube, orifice meters, the pitot tube and weirs. Today, increasing use is made of the parshall flume, one of yesterday's contributions, along with newer developments including the shunt flow gas meter, flow tubes, venturi nozzles, flumes and the magnetic flow meter. It was indicated that calibration problems exist partly because instruments are not calibrated using the medium under actual conditions of the installation. Digester gas meters of the rotary, propeller meter, diaphragm and shunt meter types are often subject to material build-up on moving parts. Pipe corrosion can induce turbulence which may interfere with metering accuracy. Sludge metering accuracy can be affected by depositions within the piping and the application of the meter must be proper to avoid operating difficulties.

Dependable Water Supply Only 7% Of Rainfall

Although the U.S. receives an average of 4,300 billion gallons of water daily in the form of rain or snow, less than one-third of this quantity reaches our Nation's rivers and little more than 7%, or about 314 bgd, is considered dependable on a long-term basis. Evaporation back to the atmosphere and water losses from vegetation immediately consume more than two-thirds of the rainfall before man has a chance to use it, and because of the variable nature of the rainfall, only a small part of the water that reaches our streams can be relied upon in all seasons of the year. These are but a few of the pertinent statistics in "Availability and Use of Water in the United States", a new Special Report published by the Water Information Center, Inc., 60 E. 42nd St., New York 17, N. Y. The 8-page fact-filled analysis is available at $2.00 per copy, postage paid.

Compared with the dependable supply, our gross National use of water today (somewhat less than 300 bgd) seems to be approaching the critical point, and for some parts of the country the critical point has already been reached. Although improved techniques for converting salt water, reducing evaporation, and modifying weather will undoubtedly help to relieve some local water supply problems, their ability to cope with regional water shortages is doubtful. The only sound solution for widespread water deficiencies is the construction of additional storage reservoirs, the expansion of water treatment programs to permit greater reuse of water, and the further development of untapped well water supplies. This is the crux of the nation's water supply problem today, to make more efficient use of all water resources and to devise new methods for re-using wastewaters over and over again.

To show the striking differences in the magnitude of regional water problems, the report compares stream flow, dependable supply, gross use, and consumptive use in each of the 17 major drainage basins that make up the continental U.S. In addition, it lists the changes in these amounts that are expected to take place by 1980. For the nation as a whole, total use of water rose from 160 bgd in 1950 to 220 bgd in 1955, and estimates place the 1980 total at around 600 bgd. By contrast, the dependable supply at our present rate of improvement may increase to only 515 bgd in 1980.

The report is the third of a series currently available from the Water Information Center. The other two are "The Future of Salt-Water Conversion" and "Water's Role in Plant Location."

Landis and Holbrook Elected to EJC Posts

James N. Landis, Vice President of the Bechtel Corporation of San Francisco, was elected President of Engineers Joint Council at a meeting of the Council's Board of Directors held recently.

Landis, who is past president and present Council member of the American Society of Mechanical Engineers, succeeds Augustus B. Kinzel, Vice President of Union Carbide, who headed EJC for the past year.

The Board re-elected George E. Holbrook as Vice President. Holbrook, past president of the American Institute of Chemical Engineers and present Vice President of E. I. du Pont de Nemours & Co., served in that post during 1960.

The National Conference on Water Pollution

■ MORE THAN 1,000 delegates gathered in Washington, D. C., December 12-14 for the first National Conference on Water Pollution. Following a first day plenary session, the attendees discussed four major water pollution problem areas in simultaneous panels. The final day was a plenary session at which 31 recommendations for action on pollution control were presented.

The four panels, with their chairmen, were:

Panel I—"Water Pollution and our Changing Times," Thomas A. McCann, Mayor of Fort Worth, Texas.

Panel II—"Meeting the Growing Competition for Water," E. A. Ackerman, Executive Officer, Carnegie Institution of Washington.

Panel III—"Keeping Water Clean," Dr. Able Wolman Professor of Sanitary Engineering, the John Hopkins University.

Panel IV—"Research and Training," Dr. Gordon M. Fair, Professor of Sanitary Engineering, Harvard University.

Panel recommendations will include modifications as presented from the floor when final conference proceedings are issued. Following is a report of the recommendations on a panel by panel basis.

Panel I

"1. There is need for a more systematic approach to the evaluation of the water pollution problems, to include health, esthetic, and market values . . .

"2. States should develop water monitoring programs for bacteriological, biological, chemical, physical and radiological quality . . .

"3. The construction of municipal waste treatment facilities should be expanded immediately with continued increases to keep up with population growth and to abate the backlog of pollution by 1970. A similar program expansion should be applied to the wastes from industry.

"4. Each Federal installation should be required by Congress to treat its wastes in accordance with the standards for cities and industries in the area, with 1964 set as the target date for providing minimum treatment.

"5. It is recommended that improved methods be developed for measuring pollution abatement progress . . .

L. E. BURNEY, SURGEON GENERAL, U. S. Public Health Service, opening the Conference, hoped that hard and realistic answers to questions of procedure, priority, and responsibility for pollution control would be hammered out.

JOHN CHARLES DALY, radio-television personality moderates Conference banquet meeting, called for apt and articulate salesmanship in overcoming public apathy and increasing awareness of the national pollution problems.

"6. The administrative level of the Water Supply and Water Pollution Control activities in the Public Health Service and in the States should be commensurate with the importance of this problem.

"7. We recommend that public policy formally recognize the recreation value of our water resources as a full partner with domestic, industrial, and agricultural values in water quality management policies and programs.

"8. We recommend that the Conference express its conviction that the goal of pollution abatement is to protect and enhance the capacity of the water resource to serve the widest possible range of human needs, and that this goal can be approached only by accepting the positive policy of keeping waters as clean as possible, as opposed to the negative policy of attempting to use the full capacity of water for waste assimilation.

"9. We recommend that appropriate public and private agencies mount and sustain an expanded program of public information . . . noting that this Conference should provide a dramatic opportunity to launch such a program.

"10. We recommend that the Public Health Service assume the leadership, in collaboration with other public and private agencies, in collecting, compiling, and publishing all known data on the toxicity of water contaminants . . .

"11. In order to facilitate assessment of the total pollution problem, it is recommended that particular attention be given to accelerating collection of information on industrial waste loading . . .

"12. The Conference feels that some financial incentive should be provided to encourage industry to install needed waste treatment facilities . . ."

Panel II

"1. Planning for the comprehensive development of each major basin or water resource area should be established as a fixed national policy . .

Consideration of every appropriate technique would be a routine part of planning for such development.

"2. Provision should be made, legally and financially, for the identification and acquisition at an early date of reservoir sites needed in the execution of comprehensive plans.

"3. Provision should be made within the Public Health Service for developing the water quality criteria which are suited to application on a national basis. However, many water quality criteria are not uniformly applicable because of the effects of area usage differences, stream characteristics and other factors. State and local determinations of some criteria also will have to be made. It is recognized that periodic revision of these criteria not only will be in order, but should be sought, as new data are made available.

"4. Enlargement and extension should be made of the water quality monitoring programs now in effect, so as to reveal more adequately conditions, existing and future, in rivers and streams.

HON. ARTHUR S. FLEMMING, Health, Education, and Welfare Secretary told the Conference he hoped for leadership from the Conference, in examining all points of view, naming goals, and identifying responsibilities relative to pollution abatement.

"5. We recommend the adoption of a National *credo,* to be given as wide and consistent publicity as is feasible. The content of the credo would be:

(1) Users of water do not have an inherent right to pollute; (2) users of public waters have a responsibility for returning them as nearly as clean as is technically possible; and (3) prevention is just as important as control of pollution.

"6. It should be regarded as an obligation on the part of industry to undertake basic research which will determine the biotic and other effects influencing the public welfare of the products they distribute . . .

"7. The value of soil conservation, sediment control, and salinity control as pollution abatement measures should be recognized through planning and budget in our National, State, and local resource development programs . . . "

U. S. SENATOR ROBERT S. KERR, indicating that the time for discussion of pollution control problems is over, suggested the need for a popular campaign and increased Federal and State government leadership.

Panel III

"1. How clean should the stream be?

The National Goal with respect to stream protection should be the safeguarding of water quality.

"2. Administration of water pollution control programs on state and interstate streams should continue to be the responsibility of the agencies which therefore must be supported by adequate budgets and staffed by competent directors, engineers, scientists and related professional personnel.

(It is essential that state legislatures appraise more realistically their opportunities and responsibilities in carrying out the principle herein stated and are urged to take appropriate action where necessary.)

"3. The Federal Government has clear responsibilities in its working relationship with state and local governments with respect to: research, leadership in personnel training, regulatory procedures, water resources inventories and investigations, and standards of water quality.

(No agreement was reached among the conferees as to extension of authority of the Federal Government in the area of water pollution control.)

"4. The Federal grants-in-aid program has provided a valuable stimulus to control of stream pollution. Other methods of financing construction of sewage and waste treatment works deserves thorough study and investigation . . .

"5. The Panel agreed that state statutes and organizational structures for water pollution control should be reviewed and strengthened or revised where necessary.

"6. There was general agreement that the public needs more information on pollution and its abatement.

Panel IV

"1. The flow of engineers and scientists who are competent to advance and administer the scientific, technological, and economic conservation of our water resources, including, in particular, the control of water pollution, must be increased promptly by recruitment and training of basically qualified personnel at two levels: (1) the professional or predoctorate level; and (2) the postdoctorate level.

U. S. SENATOR FRANCIS CASE, pointed out the problems in recapturing the freshness of water, desalting, and necessity of re-use.

"2. The capability of graduate schools

U. S. REPRESENTATIVE JOHN A. BLATNIK, reviewed progress of pollution control legislation since 1948. Stated, as did other members of Congress, plans to amend, if possible, Water Pollution Control Act of 1956.

U. S. REPRESENTATIVE WILLIAM C. CRAMER, wondered how to give the water pollution problem sex appeal which might get people interested. He also expressed fear that the construction grant program has been the tail that wagged the dog, and that policing and enforcement amendments to PL 660 are needed.

or university departments of engineering and public health to produce . . . engineers and scientists able to deal effectively with the mounting problems of water resource control must be enlarged by support of staff, student body, and teaching and research facilities, as well as by grants-in-aid of research. Interdisciplinary research should be encouraged in particular . . .

"3. The flow of research findings on the water environment must be increased and intensified in depth as well as breadth.

"4. The flow of treatment plant operating personnel as well as engineers and scientists working in the wider field of water supply and water pollution control must be increased and their training broadened.

"5. The field of water supply and pollution control has become so complex that we must think more generally than in the past, of a multi-disciplinary approach to the solution of developing problems.

"6. The total National support for research in water supply and water pollution control should be increased substantially."

Study Begun of Organic Material in Great Lakes

The Great Lakes contain the world's largest supply of fresh water —6,700,000,000,000,000 gallons of it. But, a University of Michigan oceanographer has warned, unless steps are taken to preserve these Lakes, "our children's children may be catching rain water or distilling sea water to allay their thirst."

Now U-M Great Lakes scientists believe they may be close to a method which could lead to means of preserving the Lakes as a fresh water resource.

The problem is not that the 66 million people in states touching the Great Lakes will drink them dry. Even if they were to use the water at 50 gallons per person per day without replenishment, it would be some 5,500 years before they reached final mud.

The problem is, rather, what man dumps into lakes; i.e., sewage and industrial wastes. These chemical and organic materials "age" the Great Lakes faster than they would age naturally. Lakes age by becoming increasingly more full of organic material, and "die" when they become so full of plants and silt that they cease to be a lake.

To control this aging process, thus preserving and furthering the Great Lakes use as a natural resource, is the long term goal of the Great Lakes Research Division (GLRD) of the U-M's Institute of Science and Technology.

Division scientists, working under GLRD Director David C. Chandler, now are approaching a first step toward this goal by devising a method to measure the rate at which organic material is produced in the Lakes.

New Mexico Consolidates Water Jurisdiction

New Mexico's State Engineer has brought three Southwestern underground basins under the jurisdiction of the State. His declaration of Gila-San Francisco and the San Simon underground water basins, and extending the Virden Valley underground water basin, were the result of the Arizona v.s. California water litigation being heard in the U.S. Supreme Court.

This litigation, to which New Mexico is a party, involves the waters of the lower Colorado River System. New Mexico has interests in the waters of tributaries to the lower Colorado which originates in New Mexico.

The State Engineers office stated: "The underground water basins were declared by the State engineer to avoid the possibility that persons unaware of the pending Supreme Court decision might undertake costly development of new uses from which they might be enjoined within a few years . . . Applications submitted for new appropriations within these declared basins will be filed in the State Engineer's office and action will be withheld pending the final decision . . . The State Engineer will consider and act upon applications to supplement existing water rights and applications to change point or method of diversion and place or purpose of use and will approach such applications provided existing right would not be impaired by change."

Partially Oriented on . . .

A Whiff Of Visitors

■ ONE OF THE glories of being a really *senior* engineer, one of the most beauteous perks to come as compensation for the responsibilities of holding high office, must undoubtedly be the pleasure of ringing for one's secretary and saying—"Fix me up for a couple of nights at a hotel in so-and-so"—and then putting the telephone down again. Just to think about this dream-come-true gives me pleasure and keeps me pressing on.

But contrary-wise, suppose that one of my friends-come-colleagues decides to pay me a visit. Do you know what happens? "Let's phone old Partially Oriented", says one of them, "and go down and see how he is getting on. Give him a call and tell him to fix up for two of us. No, make it three, I expect J. would like to come along."

That is all very well for them, quite a day's outing in fact—a chuckle or two, a taste of local beer, a cluck-cluck of sympathy and then a long snooze in the train. But for poor old Partially Oriented the telephone call is only the start of *his* troubles.

There are alleged hotels (too many) whose last thought is accommodation or of being accommodating. "Have you three single rooms for the night of . . ." "No accommodation at all, thank you" is the answer. I might have known.

Try the Grand Hotel now. "For the night of when? No. No accommodation at all. Crash!" 6d. gone now on telephone calls. So you try another tack with the Royal. "I suppose you haven't three single rooms for . . . ." You suppose right; they are only too pleased to get rid of you. 9d gone. (Good thing this is on the firm).

Let us now try our first reserve—the Barn. We set aside thoughts of grumbles from luxury loving engineers and try them. *Try* is the word. It takes ages just to get hold of the right person; one hangs on feeling years slip past. "Ah! I want three single rooms for the night of . . ." "Just a moment please", and you wait another century while the person at the other end has a little lie-down and a quiet smoke before he thinks up what to do about this strange request. A faint rustle of paper at the telephone . . . "Did you say the 4th, Madam?" "No, no. It's Mister. The 6th! Can you do three single rooms for the 6th and one for the 7th?" "Ummm . . ." more rustle, "Well *Sir*, I can do you one double for the 6th and two singles for the 7th. Will that do?"

If you have three people who want single rooms for the night of the 6th, and one of them, for a reason best known to himself, wants one for the 7th also, and this source of supply will give one for the former and two for the latter date, and there are only two other hotels as yet untapped, what are the chances that, not accepting this offer, you will come totally unstuck and find no beds for no persons on the nights dictated?

I find myself wondering why engineers can't sleep tucked three in a bed just for the one night. You snap out of your rumination and take the two rooms for the two nights—that leaves two engineers bedless for the one night.

And yet, there seems no reason why two engineers couldn't sleep in *separate* beds in the same room for the one night. You think if only engineers would marry each other instead of moving around singly forever demanding single rooms, there wouldn't be so much trouble for people like me. The world from Monday to Friday must be full of thousands upon thousands of single engineers floating around all trying to find single beds in single rooms far away from home. You would think they would enjoy a bit of communal living for a change. Yet anyone who has been forced to join this rootless community in a wayside hotel knows that life seems to be suspended for them. At dinner, everyone munches singly at separate tables and gets on bad terms with the waiter. After dinner, one or two, who have only the strength to climb the staircase once, creep weakly off to bed. The rest sit themselves like china frogs in front of television in a darkened room. When television ends, seven or eight more bodies transport themselves slowly and mournfully up to bed with a weary scratch or two. A few drunkards remain below to snap futile fingers at the waiter for warm whisky. The rest either speak in restrained whispers or frown at newspapers while seated in solitary chairs. The proprietor dies slowly with wishing they would all go to bed.

But next morning sees our engineers metamorphosed. Perhaps it is tea in bed in the morning. My rejuvenated guests bounce on the site, forgetting that poor old P.O. and his minions are dead beat from washing galoshes, ironing socks and filing letters in readiness for the visit.

And when they go—what is the memory of it all? Physically one has a taste of too much smoking and cold tea drunk in a hurry. Aurally it feels like standing in a playground the moment the children have gone into school. Though, in retrospection, these were occasional moments of compensation . . . .

There is a knock on my door. "Would these be yours, sir," says a dispirited comrade, holding up a long length of tailoring material. I rise to inspect. "A pair of trousers! Of course not you idiot, how could they be," I snap irritably. "Well sir, they don't belong to any of us so I am thinking . . ."

A warm sense of pleasure comes over me. "Ah! Aha! One of theirs. One of them's gone off without his trousers, eh? Without his *best* trousers too!" This is a pregnant thought.

We inspect the trousers. It is not often one gets the chance of making such a critical examination in the absence of the person. "Sits about a good deal doesn't he? My goodness,

CONTINUED ON PAGE 92A

Bond interest rates, taxation and regulation have definite impact on . . .

The Outlook for Water Company Financing

by F. J. McDIARMID,
Vice President
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EDITOR'S NOTE: In this paper, presented before the Eastern Water Company Conference, November 11-13, 1959, in Atlantic City, N. J., Mr. McDiarmid suggests reasons for the difficulties that persist in water company financing. Published with permission of the Conference, the paper continues our series covering areas of particular interest to private water company managers.

■ The largest risk element in good utility bonds, such as water company bonds, is not that the contractual dollar payments will not be made as promised, but that the dollar continues to shrink in value. Since 1958, the dollar, according to the Consumers Price Index, has lost 1% of its value. This is a slower rate of loss than the average during peace and plenty since 1952, which was at the rate of about 1-½% per annum.

It is because of this factor that bonds have become increasingly less popular and equities more popular. Common stocks as a group, and even public utility stocks, are generally higher priced than in 1958, although down considerably from their highs reached in the summer of 1959.

Individuals concerned with finances have a pretty good idea of what has been going on in the bond market. The fact that the United States Treasury paid 5% on $2 billion of notes due four years and ten months hence was front page news. A little before that, it had paid 4-¾% on notes due in one year. In September 1959, a large electric utility paid a 5.77% money cost on its first mortgage bonds and in the same month a member company of the American Telephone & Telegraph System paid a 5.72% money cost. The latter was the highest rate paid by a member of that system since the tight money period of the early 1920's, over thirty-five years ago.

Some Fact About Interest Rates

Since water companies, along with other utilities, have been accustomed to raising most of their outside capital requirements through the sale of bonds, the following ideas about interest rates are pertinent.

Interest rates have returned to what might be described as normalcy. Presuming there is such a thing as normalcy in our world, the point is that the period from 1929-51 was highly abnormal as far as interest rates were concerned. It is a period which is very unlikely to be repeated in our time. The first half of this period was one of deep depression and very low demand for capital, and one in which the monetary authorities strove to make money plentiful. This was a period of low and declining interest rates. The second half of the period was one of war and post-war recovery in which interest rates were kept very low through the Federal Reserve supporting the bond market. The money supply was very greatly increased. This whole period of over twenty years was one of artificially low interest rates. It is now definitely past history.

As a result of this situation, buyers of bonds over the past generation have had a very bad time of it, and the bond has greatly lost popularity as a medium for investment. To illustrate what has happened, I have worked out a practical example. The bond issue dealt with here was a very high grade long term public utility issue. It was sold in 1945. I have converted the dollars representing interest payments to date, and the dollars representing the current market value into dollars having the same purchasing power as those which were originally paid at their time of issue. It required, for example, only $62 of 1945 purchasing power to

LOSS OF VALUE and decline in interest has reduced popularity of bonds since 1945. Investment and return are but a shadow of their former selves.

equal the purchasing power of $100 in 1959. Thus, the bond issue, which has a present market value of $7.0 per $1,000 bond, has a present real value equivalent to only $441 of the kind that was paid for the bond back in 1945. Also, the issue has paid $371.25 of interest to date. But this interest was paid in dollars of varying purchasing power, and they had a real value at the time they were paid equal to only $264 in 1945.

Therefore, the value of both the present market price and all interest payments to date was worth only $705 of 1945 purchasing power. This was 30% less than the $1,018 paid for the bond. So you see that the buyer of that bond has gotten no real return at all but has suffered a capital loss of 30%. That is what a combination of artificially low interest rates and inflation did to him.

Now if you purchased a stock and over an extended period of years the shrinkage in value greatly exceeded the dividend return you received, you would say you had made a very poor buy. Over the last twenty years the buyers of bonds as a whole have had just such an experience.

Another reason that bonds have lost status is that interest rates in recent years have had a fictitious quality, some of them more fictitious than others. The causes of this were inflation and taxes. In an earlier and simpler period in our history, when you bought a bond you looked upon the interest as a real return. You paid very little of it in taxes and you had no thought but that the real value of the principal would remain intact. In fact, insofar as we have figures to prove it, the real value of our dollar was actually greater in 1940 than in 1800. It was certainly in the years prior to 1940 that the expressions, "bloated bondholder" and "sound as a dollar", originated. Currently we might say "deflated as a bondholder" and "sound as a dollarette." It is a very interesting historical fact that interest rates started upward and prices also started upward at almost the same time at the turn of the century.

I wonder what interest rate the United States government would have to pay today if it were to sell tax-free bonds and through some device was able to guarantee their holders against inflation. My own guess is that it could sell huge amounts of them at an interest rate of 3% or lower and they would be in great demand all over the world.

The Impact of Taxation

Now let us consider the subject of taxes. They are the factor, besides inflation, which introduces a large element of friction into interest rates today. I am concerned with this subject at this time because in 1959 Congress passed a new income tax law which greatly changes and increases the impact of taxes on interest collected by life insurance companies. Utility managers should be very much interested in this matter, too, because to the best of my knowledge the life insurance companies have been by far the most important holders and buyers of water company bonds.

For a long time, of course, tax-exempt municipal bonds have had a distinct advantage over fully taxable corporate bonds and mortgages. Until this year, however, this advantage in the case of life insurance companies was not great. It was equivalent to about 8%. This meant that a 4½% municipal bond was no more valuable than a 4.9% corporate bond, so that the amount of municipal bonds purchased by life insurance companies was relatively small.

The new tax law has changed this very considerably. This tax is a very complicated thing and the last thing in the world I would try to do is to explain it to you. The Russians have figured out a way to send a satellite around the moon, but we haven't yet been able to figure out all the workings of our new tax. The reason is that our tax is harder.

The impact of this tax is much greater on some life companies than on others, and it hits some stock life insurance companies, such as our own, particularly hard. In our case we now figure that 76c of tax-exempt interest is about as valuable as $1 of taxable interest. This means that a 4½% rate on a municipal bond is equivalent to a 5.9% rate on a corporate bond. The result of this has been to make corporate bonds, such as water bonds, which yield less than 6%, unattractive to us in the present market.

We are probably an extreme case and the impact on most life insurance companies is considerably less than on us. However, the result of the new tax has been to greatly increase life insurance company buying of tax-exempt bonds and to correspondingly reduce their buying of corporate bonds. Since the market for corporate bonds, including public utility bonds, is now very largely a captive one with life insurance companies and pension funds, this new tax cannot help but increase the cost of money to such borrowers. The purchase of tax-exempt bonds by life insurance companies this year so far has been over twice what it was last year. In our own case, which is exceptional, 68% of the net increase in our entire bond account so far this year has been in tax-exempt municipal bonds.

It is, however, an ill wind that blows nobody good. Let us consider the case of preferred stocks. For a long time these have been a rather unpopular type of security, having neither the first lien contractual position of a bond, nor the chance for appreciation of a common stock. The market for them was, therefore, quite

limited and sometimes very difficult to find.

However, under the new life insurance income tax law, stock dividends are now 85% tax exempt since they represent a payment from one corporation to another. Life insurance companies have, therefore, become very interested in preferred stocks and since the supply of them is rather limited, their prices have been bid up relative to bonds. In fact, they have recently been selling to yield very little more, and sometimes no more, than the mortgage bonds of the same or similar companies. In the past these bonds have tended to yield an average about 1% less than preferred stocks, and sometimes the spread has been even greater. This, therefore, is a relatively favorable time for a public utility to do preferred stock financing.

Impact of Regulation

What should be the impact of these changed conditions on public utility regulation and the regulation of water companies in particular? In the first place, your senior capital is probably going to cost you much more in the future than it has over the past generation. Too much regulatory thinking today remains conditioned by the artificially low interest rates that prevailed over the period ending in 1951, and it had overtones lasting for several years thereafter. It is highly unlikely that we will go back to such a period at any foreseeable time. Any attempt by the Federal Reserve authorities to again support the bond market would be widely interpreted as a signal that we are in for another wave of inflation and would precipitate a further flight from bonds. The Federal Reserve people understand this, even if certain members of Congress do not seem to. We have used up all the slack in our financial system created during and after World War II, as is reflected by the heavily loaned-up conditions of the banks and tight money in general. We dare not create more slack if inflation is to be restrained.

During the long period of artificially low interest rates, public service commissions tend to adjust downward the rates of return which they were willing to allow. Today there is good reason why these rates of return should be adjusted sharply upward if the utilities are to attract the capital which they will require. If this is not done, the utilities might find it difficult to justify the raising of new capital at prevailing costs, or they might find it more profitable to invest their funds in Government bonds rather than utility property.

Secondly, the progress of inflation over the last twenty years has rendered obsolete the concept of original cost as the sole basis for rate making. Recently a utility, with which I am connected, revised its pension plan. The old pension plan was one which you might say was established on the basis of original cost. That is, a pension credit payable annually on retirement was built up each year equal to a small percentage of that year's salary. This plan resulted in inadequate pensions on retirement for the older employees, a large part of whose credits were built up in the years gone by, when the dollar was worth a lot more and dollar salaries were very much lower. The company, of course, could have taken the attitude of many public service commissions that they were not responsible for the inflation and refused to adjust their thinking. This would have worked a real hardship on many retired employees and many soon to retire. In revising the plan, one of the steps taken was to put a floor under pensions by providing minimums related to a percentage of pay in the best five out of the last ten years of service. This was the equivalent of switching from an original cost attitude to one of present value. The new plan, of course, gives major weight to the present level of wages and the present purchasing power of the dollar. While it cost the company a lot to do this, it seemed the only reasonable thing to do.

Likewise it seems only proper to recognize the simple fact that the investment represented by dollars of much larger value than today's dollars should receive a larger dollar return than the smaller, more recently invested dollars. And that is just what original cost fails to do. Those jurisdictions which fail to take account of such simple facts of life hardly encourage investment in the utilities domiciled therein.

Some Prevailing Misconceptions

Within the last two years I have become involved in rate cases on behalf of water companies in three important jurisdictions. This experience has given the impression that in some areas at least water companies tend to be treated as the Cinderellas of the public utility industry. In our analysis of water companies we frequently encounter cases where the rate of return being earned on stated capital is materially below the cost of first mortgage bond money in today's market. Of course, on a rate base reflecting reproduction costs to a reasonable extent, the rate of return would be lower still.

In the case of one water company which recently came to my attention, the rate of return earned on the stated capital in the year ending June 30, 1959, was under 4%, less than the current rate on short-term U. S. Treasury bills. For a number of years prior to that, the return earned was lower still and in one recent year was even negative. This company is currently trying to sell first mortgage bonds on a 5½% basis and debentures on a 6% basis. In spite of a favorable attitude toward the senior securities of water companies —we hold well over $40 million of water company bonds and preferred stocks—we were forced to decline this one. When one thinks of all the earnings that this company was entitled to over the last half dozen or more years but which it didn't get, one reaches the conclusion that it should not be classed as a public utility but as a charitable institution.

This was an unusual situation but it highlights a state of affairs which is altogether too widespread among water companies. What are the underlying reasons why so many of these companies tend to be treated in rather a niggardly fashion by the regulatory authorities? I think I can name a few:

1. There is a belief that the risk in investing in a water company is less than in the case of some other type of utility and, therefore, they should be held to a lower rate. My answer to that one is that the most serious risk incurred by any utility is that it will not be permitted to charge rates sufficient to produce a reasonable return. The investors in some water companies at least have had practical experience with this type of risk.

2. There is a belief that water service is more essential than any other type of utility service and so its costs should be kept as low as

possible, even if this produces a substantial rate of return. I don't think that this is true anymore. Water service, while necessary, is no more so than electricity or gas service. Consider the recent electrical blackout in New York. Would the shutting off of water for a similar period have been more serious? After all, you don't have to drink water, and some have other preferences.

3. Water companies can raise capital more cheaply than other types of utilities. This just isn't so and I would be happy to prove it at any time.

4. Water companies are relatively mature organizations, and unlike the electric companies, for example, do not require much new capital and not much in the way of earnings is required to attract what they do need. This I would call the rat-trap approach to utility regulation. It treats the utilities well only until they get the needed money and then cuts them down to size. It doesn't bother much about fair treatment of the capital already in the business. Besides, it is based upon a false premise. Many water companies, probably most of them, have a continuing heavy demand for new capital.

Certainly the water companies in presenting their cases for a reasonable return should not rely entirely on the usual stereotyped approach. A broad picture of the rapidly changing economic factors affecting the cost of capital should also be presented. I have tried to briefly review some of these factors.

Illinois Report on Artificial Ground Water Recharge

How research paid off in a practical solution to the water supply problems of one city is told in a report published by the State Water Survey, scientific research division of the Illinois Department of Registration and Education.

Through some nine years of research, Water Survey scientists developed a successful pit method of artificial recharge for the heavily-used underground water supplies at the City of Peoria.

This method now contributes substantially to maintaining the water table in that area. The Survey gained, at the same time, a valuable scientific foundation for future application of such methods in other areas of the state.

The new publication describes this research, the types of recharge pits constructed and the operating techniques developed. Also it summarizes eight years of operating records to show capacity and cost information.

Artificial replenishing to build up declining water levels in well fields was not a new idea. Landflooding, recharge wells and other methods had been tried in various parts of the world in the past, but each had drawbacks for use in the Peoria area.

To find a method of recharge to meet the needs peculiar to Peoria, the Water Survey constructed one pit, and later a second one, and experimented with various designs, filters and procedures of operation, all based on detailed theoretical calculations.

Early success with these pits led to construction of similar ones by local industries, the Bemis Brothers Bag company and the Peoria Water Works company. Results from operation of all four pits are included in the Survey report.

Rates of infiltration through the pits reached as high as 175 ft per day in the second experimental pit and up to 200 ft per day in one of the industrial pits. This is in contrast to average rates of one or two ft per day by landflooding methods and variations of from five to 53 ft per day in other pit operations.

In 1959, the quantity of recharge by means of the four Peoria pits amounted to 13 per cent of the total ground water pumpage, a significant contribution to the area's ground water resources.

While recharge is made at a high rate of infiltration, water temperatures are kept within desirable limits, an important factor to Peoria industries. Operating costs are low in comparison to other solutions for their water problems. Also, a significant step has been made toward stopping recession of local ground-water levels.

The report, "Artificial Ground Water Recharge at Peoria, Illinois," was written by Dr. Max Suter, former head of the Water Survey's Peoria Laboratory, and his successor, Robert H. Harmeson. It is listed as Bulletin 48 and may be obtained by writing to the State Water Survey, Box 232, Urbana, Illinois.

New Zealand Vistitor Studies Pennsylvania's Streams

Pennsylvania's Clean Streams program received close attention recently from a visitor from far away New Zealand. He is Colin A. Cowie, of Wellington, N. Z., a sanitary engineer with the New Zealand government, who arrived in Harrisburg for several days stay. While here he will talk with officials of the State Health Department's Sanitary Engineering Division and will study methods of water pollution control in the State.

Cowie said Pennsylvania's problems with water borne wastes are similar in some ways to those of New Zealand. "Solar ponds," in which sunlight helps render harmless the sewage in settling basins, have been approved recently for four localities in Pennsylvania. These so-called "oxidation ponds" are being adopted in a number of places in New Zealand, and what may be the largest such pond in the world (1,200 acres) is being built to serve the City of Auckland, Cowie said.

Waste from pulp and paper mills constitutes a "serious" pollution problem in New Zealand, Cowie said. So, he wants to learn how similar mills in Pennsylvania (such as those in York County) are treating their wastes.

One of the biggest problems in industrial wastes treatment in New Zealand, Cowie disclosed, is in rendering harmless and disposing of wastes from meat packing plants, since New Zealand processes large quantities of meat from its fertile farmlands.

Cowie is visiting in the United States for a year under the sponsorship of the United Nations' World Health Organization. His work includes assisting in the design of water supply and sewage treatment works. On his return to New Zealand he will be active in pollution survey and control work, including industrial wastes, as an engineer with the Public Health Engineering Section of the New Zealand Ministry of Works.

He will serve as a consultant to the Pollution Advisory Council, which is the equivalent of the Sanitary Water Board.

RESEARCH PROGRESS REPORT

Growth in many areas under various conditions describes . . .

Occurrence of Beggiattoa Species Relative to Pollution

by JAMES B. LACKEY
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EDITOR'S NOTE: In the continuing studies of biota as indicators of water resource pollution, an occasional blank is drawn. Professor Lackey and his associates conclude that the Beggiatoa are not responsive to environmental pollutional changes. This finding is a significant contribution to the growing volume of pollution control references.

■ Reference is often made to the cosmopolitan distribution of organisms. In a sense this is true, but it actually means the occurrence of certain environmental conditions within the range of tolerance of a given organism, in different parts of the world. If an organism tolerates only a narrow range of pH, pH at once becomes a sharply limiting factor. If low salinity only is tolerated, the organism is barred from the oceans and many inland bodies of water.

The bacteria of the order Beggiatoales seem to be widespread for the most part, but Bergey's Manual of Descriptive Bacteriology[1] is dubious about the distribution of some of them. In the past four years many waters of the United States have been searched for Beggiatoles and many publications have been reviewed for their distribution in other parts of the world.

The genera *Beggiatoa* and *Thiothrix* with six and seven species respectively, are easily recognized. Others are less easily recognized, primarily because they may be mistaken for other organisms, or perhaps because they are rare. Thus, we have found no references to *Thiospirillopsis* other than that of its original description by Uphof[2]. *Thioploca* is of doubtful validity; it has not been found at any location investigated by us in the past four years, and is not considered here. The fourth genus, *Thiodendron*, is new and its position and name are tentative, but it would add a new family, *Thiodendrales*. It has been found in two locations, where it appears to be a permanent inhabitant. It is included in this discussion because its occurrence is unique.

Table I gives the occurrence of the known species of the four genera mentioned. Only *Beggiatoa* and two species of *Thiothrix* have been widespread in four years of active search for members of the order. It seems then, that any ecological (indicator) use of Beggiatoales might well be restricted to *Beggiatoa* to be commensurate with time expended. Four of the six Beggiatoa species are illustrated in Figures 1 and 2.

Factors in Distribution of Beggiatoa

Four of the species, *minima, leptomitiformis, alba* and *arachnoidea* are regarded as ubiquitous, both fresh water and marine. This is in accord with our records of occurrence. In addition, *alba* and *minima*

Table I
Observed Distribution of Fifteen Species of Beggiatoales

	Fresh Water				Ocean					
	Fla.	Woods Hole	Col.	Lake Alice	Fla.	Woods Hole	San Diego	Desert Waters, Cal., Nev.	Warm Min. Springs	Thermal Waters, Other
Beggiatoa minima	x	x	x	x	x	x	x	x	x	
" leptomitiformis	x	x	x	x	x	x	x	x	x	
" alba	x	x	x	x	x	x	x	x	x	x
" arachnoidea	x			x	x	x	x			
" mirabilis					x	x	x		x	
" gigantea					x	x	x		x	
Thiothrix nivea	x	x	x	x	x				x	
" tenuis	x	x	x	x	x	x	x		x	
" tenuissima	x	x	x						x	
" voukii (n.e.)										
" longiarticulata (n.e.)										
" annulata (n.e.)										
" marina (n.e.)										
Thiospirillopsis floridana	xx						xx*		x	
Thiodendron mucosum	x								x	

x = Personal Observation
xx = From the Literature
Often a single record.
(n.e.) = Not personally encountered: all these presumably from ocean or brackish waters.
* = Identity not certain. From Pacific Grove, Cal.

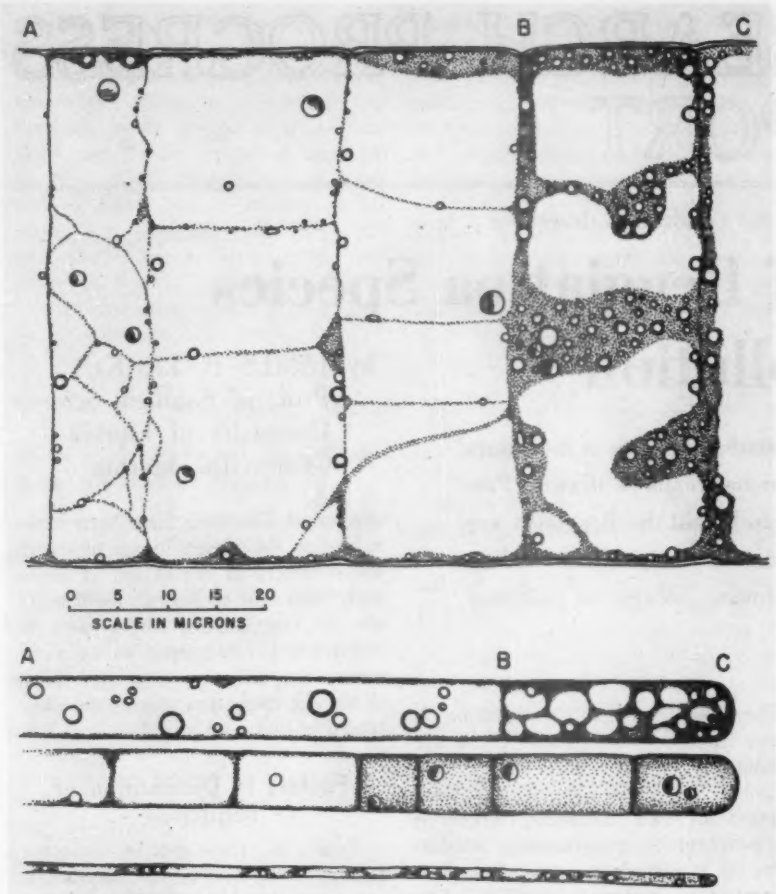

Fig. 1. THREE OF the six species of Beggiatoa. Shown are the largest, B. gigantea, a marine form, B. arachnoidea (two strands) either fresh water or marine and B. leptomitiformis. B. alba, most common species, and B. minima, the smallest, are not illusrtated. A-B is an optical cross-section showing internal structures, while B-C is a surface view.

have occurred in springs and waters around Las Vegas, Nevada, which were admittedly of high salt content, usually magnesium salts. The species *mirabilis* and *gigantea* have been found in brackish water, and in Warm Mineral Springs, Florida, which is about half sea water, 17000 ppm Ca. Obviously, they are not restricted to sea water of high salinity i.e., they would come into Dahl's[3] pleiomesohaline ecological category. They have also been found in waters whose osmotic characteristics have been due to other salts, as in some Death Valley locations. Considering their size however, it would hardly be possible for them to have been missed if they occur in fresh water.

Alkalinity

Most of the water containing *Beggiatoa* is pH 7.0 or above. In fact, bottom samples from many soft water locations have not yielded a single specimen of *Beggiatoa,* whereas many hard waters contained them in abundance. Since they are generally supposed to be anaerobes, and since they thrive in "sulfur waters" this is surprising. Hydrogen sulfide tends to produce acidity, and any marked concentration of *Beggiatoa* species is always coincident with a pronounced odor of H_2S. It is worth noting however that Wheatland[4] has shown H_2S and O_2 can co-exist in solution when the DO does not exceed 0.16 ppm; in excess of this, H_2S would not be formed, and that present would be precipitated, at least in the presence of light.

Oxygen

Oxygen then, acts as a limiting factor for the presence of *Beggiatoa* in excess of 0.16 ppm. The organisms die out rapidly in runs from sulfur springs as the water becomes aerated. There is indirect evidence also that some DO is necessary. In Warm Mineral Springs no *Beggiatoa* are found from a depth of 160 feet up to a depth of 35 feet. At this point the sides of the "chimney" recieve enough light for the growth of blue green algae, and at once sulfur bacteria (as well as many other organisms) appear. There is very little change in the amount of H_2S from 160 feet to the surface. Unfortunately no oxygen determinations have been made at these depths; Winkler determinations simply give a blank.

The need for at least a small amount of oxygen by *Beggiatoa* is shown in its use of H_2S. Winogradsky[5] who was never able to secure pure cultures, nevertheless proved that *Beggiatoa* and *Thiothrix* oxidized H_2S, and had no need for organic (carbon containing to him) matter. The type reaction is:

$$H_2S + O \rightarrow H_2O + S + 3000 \text{ Cal.}$$

This to him was respiration, and any necessary carbon must have come from CO_2. The sulfur was stored, as small "globules semi-liquids" and never took the form of crystals in living filaments. The sulfur could be further oxidized to H_2SO_4 which was neutralized in the environment. But H_2S was necessary for the life of these organisms. Subsequent to 1889 Keil[6] showed that the source of

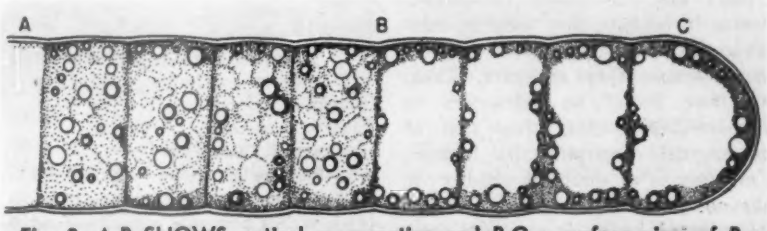

Fig. 2. A-B SHOWS optical cross-section and B-C a surface view of B. mirabilis, a marine form.

nitrogen for these bacteria could be ammonium salts, also that no CO_2 was excreted by them. They are thus autotrophs. Nevertheless in our laboratories, where we have obtained pure cultures, no growth has been obtained without some organic matter. Acetate for example produces heavy growth; however it has not been possible to transfer and get satisfactory growth. Evidently there are unanswered questions.

This autotrophic character, plus the fact that at best only a minimum of O_2 is needed by these organisms explains how they can live in highly polluted areas, yet not be indicators of pollution. In such situations CO_2, NH_3, sulfides and sulfates are usually abundant. Other bacteria can reduce the sulfates and organic sulfur compounds, and if light is present even in small amounts, some oxygen will be produced by photosynthetic bacteria, blue green algae, or any other means of oxygenation, regardless of how rapidly used. The necessary substrate materials are natural concomitants of pollution, so the Beggiatoales thrive, unless directly toxic materials are present. They can find the needed materials in situations also, where there is no pollution. The large numbers of *Beggiatoa* in the canyon off the Scripps pier may be directly related to the large amounts of sulfur in the dead and decaying kelp, *Macrocystis pyrifera*, which also accumulates there at times. Lack of a mechanism for any oxygen production in sewage digesters may explain the absence of *Beggiatoa* there, whereas it is often abundant where some aeration is present, as in Hayes treatment plants.

Light

Light does not seem to have any other direct affect on the distribution of *Beggiatoa*. However, in our laboratory it has been observed that gross cultures in a jar containing considerable debris will crawl into the debris, when in the light, but if the jar is put in the dark, within an hour the bacterium will have crawled out upon the top of the debris. This has been tested repeatedly only for *B.alba*. It is in direct contrast to the behavior of certain blue green and green algae which are positively phototactic.

Pressure

Hydrostatic and atmospheric pressures within the ranges 0 to 120 feet in the ocean, and 270 feet below to 9000 feet above sea level respectively are not preclusive. *Beggiatoa* has been found in the canyon off the Scripps pier at 120 feet, and there is often a white coating on parts of the canyon floor. Species of the genus have also been found in Death Valley and above 9000 feet in the Colorado Rockies.

Temperature

Temperatures ranging from about 10°C. to about 50°C. have been noted in the field, where *Beggiatoa* was abundant. At Pagosa Hot Springs in Colorado, *Beggiatoa* occurred in water hardly tolerable to the hand. Dr. Roger Mitchell of the Univ. of Florida biology staff has supplied material from various thermal springs in the Pacific Northwest which contain blue green algae and *Beggiatoa*.

Thiodendron was originally found only in Warm Mineral Springs, and since a great many areas had been sampled for sulfur bacteria, it was thought that this might be a salt or brackish water form restricted by temperature, which is fairly constant at 28.5°C. in this spring. Subsequently one of the staff brought in a collection of sulfur bacteria from a highly polluted area behind a crab-packing plant at Titusville, Florida, on the inland waterway. This proved to contain *Thiodendron*, which has been repeatedly collected there, at temperatures from about 10°C. to 24°C. This area is polluted, often heavily; Warm Mineral Springs is not. About the only common factor is that both situations have about 17000 ppm sea salts.

Summary

It is seen from Table 1 that *Beggiatoa* species are widespread. Only two species, *mirabilis* and *gigantea* apparently are restricted to brackish or salt water. A brief look at environments in which all six have been found indicates their tolerances for environmental factors are rather wide with one exception. That is an absolute necessity for some H_2S, and traces of O_2. And they are not satisfactory indicators of pollution.

Acknowledgment

This work was done under the terms of a grant-in-aid from the U.S. Public Health Service.

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Guide for Mobile Home Sanitation

A guide to mobile home park sanitation designed to serve the growing number of Americans, now estimated at 4 million, who live in mobile homes, has been released for publication by the Public Health Service.

The manual, "Mobile Home Park Sanitation and A Suggested Ordinance" was prepared because of numerous requests from health departments and the industry for a sanitation guide comprehensive in scope and useful to local authorities, mobile home park operators, and manufacturers and mobile home owners. It constitutes a revision of "Trailer Court Sanitation," originally published in 1953. Broad enough in scope for Nationwide use, yet easily adaptable to local regulations, the booklet has been carefully planned to include the latest thinking in design, construction and operation.

Various state and local health agencies, the Mobile Home Manufacturers Association, the National Conference of State and Regional Mobile Home Associations, and the Trailer Coach Association assisted in reviewing the document.

Individual copies are available from the Public Health Service, Washington 25, D. C. In addition, the publication is being printed and distributed on a Nationwide basis as a public service by the Mobile Home Manufacturers Association, the Mobile Homes Research Foundation, and the Trailer Coach Association (West Coast).

Excavation and Pipe Foundations
for Sewage Collection Systems

by KENT S. KASER
Sanitary Engineer
William Matotan & Associates
Albuquerque, New Mexico

EDITOR'S NOTE: Good water and sewage pipe installation involves a great deal of attention given to the mechanics of construction and supervisory detail. This article serves as a review of some of the more important things to consider and of the methods that make an installation a successful one.

■ MODERN LIVING demands modern sewage collection systems, regardless of the conditions that may be encountered in the construction of these facilities. As would be expected, the problems in the sewer construction field are many and frequently complex. Correct methods of excavation and the choice of proper pipe foundations are primary factors to be considered during both design and construction of sewage collection systems. Sewers must be installed in all kinds of soil, from soft sandy soil above ground water to hard coral rock well below the water table. A thorough knowledge of the actual conditions to be encountered in any particular project is necessary to assure a well-designed and well-constructed installation that can be expected to perform its function for many years.

Soft Sandy Soil

Of the various conditions encountered, probably the simplest and least costly to contend with is construction in soft, sandy soil. Excavation is easy and fast, usually being done up to depths of 22 feet with a backhoe, with draglines or clamshells taking over in deeper cuts. At normal depths, the bottom of the trench is easily shaped to fit the barrel of the pipe. Proper bedding of the pipe is not a serious problem in this type of soil, because the pipe practically beds itself. However, there can be problems here that should be of concern to the contractor as well as to the inspector on the job. The walls of the trench are subject to caving and should be watched very closely, especially when men are working in the trench. Where room is available on the surface, the trench walls may be sloped sufficiently to minimize caving. If there is not adequate room for sloping the walls, they should be sheeted or braced. Many contractors use a steel box, usually about 8 feet long, 2½ to 3 feet wide, and as high as necessary to protect the men. The box is pulled along in the trench as the work progresses. This is usually a satisfactory arrangement, but there is always a possibility that when the box is pulled forward, it may catch on the bell of the last section of pipe, disturbing that section or even pulling the joint loose. This difficulty can be overcome by holding back against the bell of the last section of pipe with a shovel or crowbar while the box is being moved.

Probably the most difficult condition to control in this type of soil is the trench width at the top of the pipe. This of considerable importance because it directly affects the loading on the pipe. Where a box is used the width can be controlled by removing the last 8, 10, or 12 inches of the excavation by hand inside the box, the actual depth to be hand excavated depending on the size of pipe to be installed. This hand work requires very little additional time in this type of soil. When sheeting is used there usually is no problem of trench width, inasmuch as the contractor, for reasons of economy, will probably maintain as narrow a trench as possible.

Backfilling should be done by hand around the bottom half of the pipe barrel and thoroughly compacted to provide a firm and uniform bed. This compaction is usually done with hand tampers; however, under certain conditions this compaction may be accomplished by means of puddling with water. Before this method is approved, tests should be made in the field to assure that proper compaction will result under actual field conditions. The backfilling should be continued by hand and thoroughly compacted to approximately 18 inches above the top of the pipe in order to assure uniform loading on the pipe and to effectively dissipate any shock load that might occur during the machine backfilling operation. The remainder of the backfill with this type of soil can usually be effectively compacted by thorough puddling or ponding with water. Figure 1 shows a typical section of a pipe installation in this type of soil.

Even when ground water is encountered it is usually not too difficult to dewater the trench by means of a simple wellpoint system. Many times a contractor will attempt to sidestep the wellpointing operation by merely pumping out the excess

water in the trench with a sump pump. There are at least three important reasons why this should not be permitted. First, it is practically impossible to keep the pipe joints clean when there is any water in the bottom of the trench. Wet sand will be trapped in the bottom of the pipe bell when the joint is made up and such a joint will eventually be a source of trouble with ground water infiltration. Second, it is usually necessary to remove the pump suction line before backfilling; this allows the water level to rise over the pipe before it is properly backfilled, and there is a good possibility that the pipe will float out of proper alignment. Third, certain joint materials are adversely affected by being allowed to become wet before they have had a chance to set up. The resident engineer or inspector on any sewer construction project should insist that, wherever possible, the pipe be laid in a dry trench, and the contractors should take this into account when preparing their bids.

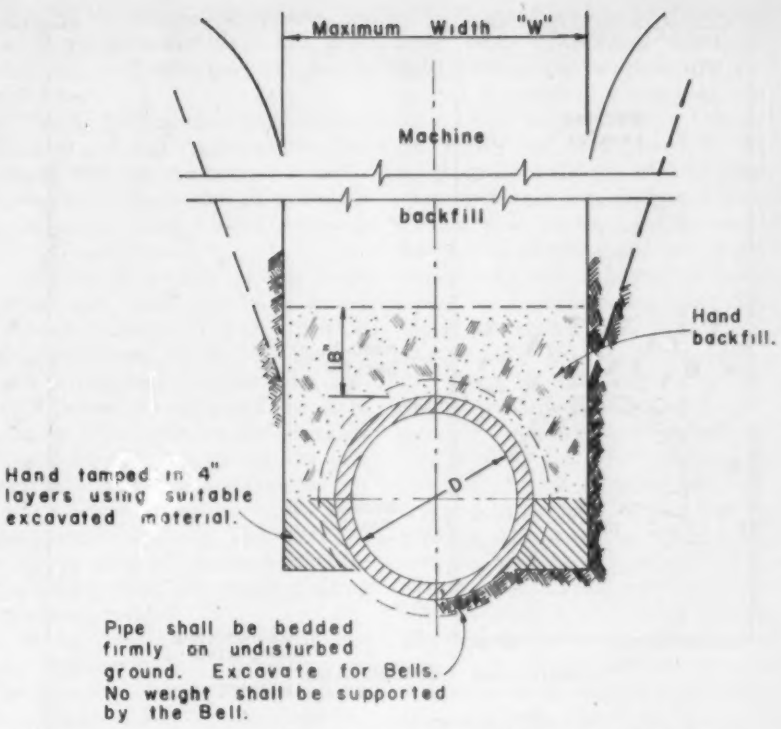

Maximum Width "W"
Machine
backfill
Hand backfill.
18"
D
Hand tamped in 4" layers using suitable excavated material.
Pipe shall be bedded firmly on undisturbed ground. Excavate for Bells. No weight shall be supported by the Bell.

FIG. 1. TYPICAL SECTION showing pipe installation in soft sandy soil.

Clay Soils

Construction of sewers in clay has both advantages and disadvantages over construction in soft sand. When the clay is relatively dry, the excavation itself may be even simpler from the contractor's viewpoint than in the sandy soil previously discussed. It is usually done with either a backhoe or a trenching machine. Although trench walls may be kept practically vertical with little danger of caving, it is cheap insurance against possible injury or loss of life to brace the trench walls at regular intervals. Trenches need usually be only as wide as the bucket on the excavating machine. If a backhoe is used, the bucket width will seldom be less than 30 inches for trenches up to 10 feet in depth. When deeper cuts are encountered, a larger machine with a larger bucket is usually required.

It should be kept in mind that, due to present high labor costs, time-consuming hand work should be kept to a minimum. As a result, it is no longer realistic to require in the specifications for sewer construction in clay that the bottom of the trench be trimmed by hand to fit the barrel of the pipe, because few contractors, regardless of the inspection, will see that this is properly done. Figure 2 shows a much more practical method of construction under these conditions. The trench is excavated to approximately 4 inches below the bottom of the sewer pipe (additional depth is required when sewers exceed 15 inches in diameter). Sand or other pliable bedding material is then placed and compacted in the trench to bring it to proper grade. After the pipe has been laid, additional bedding material is placed around the pipe up to one-quarter of its outside diameter. The backfilling is again done by hand to approximately 18 inches above the pipe in a manner similar to that discussed for soft sandy soil. Although the remainder of the backfill can be suitably compacted by ponding with water, it is a much slower process than when used with sandy soil. Compaction using mechanical tampers is probably the more desirable here and it is not unreasonable to require a contractor to use this method because the trench widths are narrow and the volume to be compacted is minimal. If the ponding method of compaction is used, a close check of the pipe loading should be made, inasmuch as the overburden will be heavy saturated clay with a low friction coefficient. These conditions result in an exceptionally heavy loading on the pipe.

Probably one of the worst conditions to be encountered in the installation of sewers is soft wet clay. When this is encountered the contractor is faced with caving trench walls, difficult dewatering, unstable foundation conditions, and unpleasant working conditions for the men. Because it is very difficult to lower the water table by means of well-pointing, the contractor is faced with sloughing or caving of the trench walls. This can be controlled by some method of sheeting. In cases where extreme conditions are encountered, solid sheeting will be required. This is a costly and time-consuming operation, but it is necessary to maintain allowable trench widths and to provide the necessary safety measures for the men in the trench.

The sewer pipe foundation must be prepared so that unequal settlement will be held to a minimum. Figures 3 and 4 show methods of installation where sheeting is not required. Figure 5 shows the method of construction where solid sheeting is used. Whether the method used should correspond to Figure 3, 4, or 5, or even possibly some other method, will depend on the conditions encountered. Regardless of which method is used it will probably be

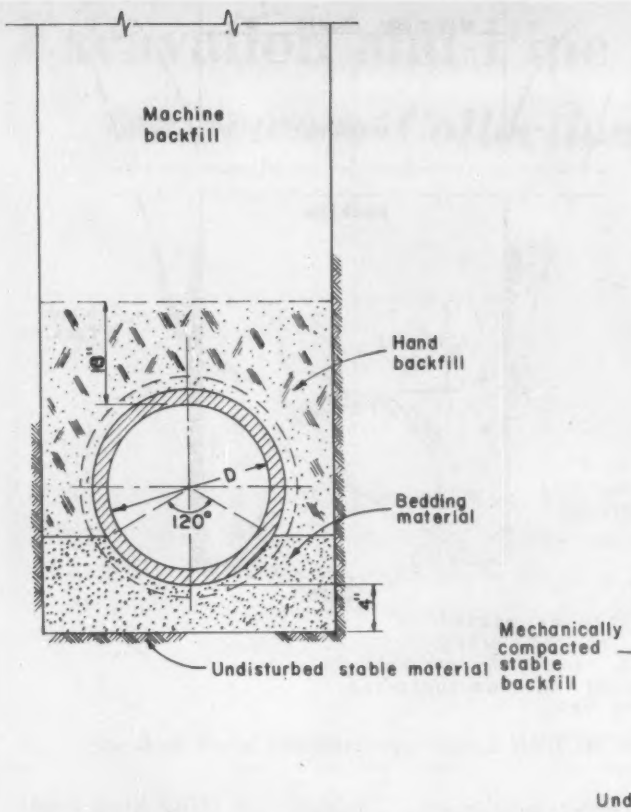


FIG. 2. TYPICAL SECTION showing pipe installation in extra hard clay.

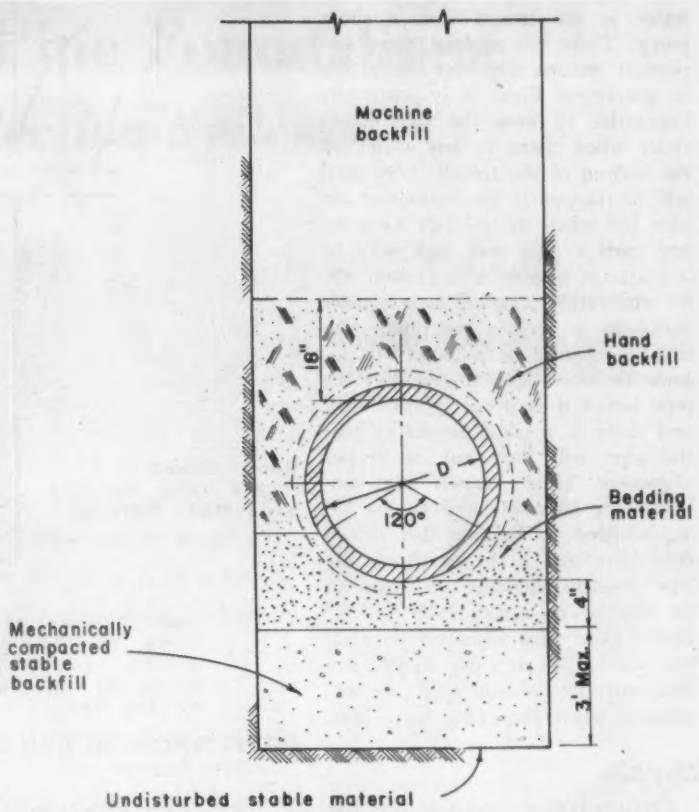


FIG. 3. TYPICAL SECTION showing pipe installation in soft clay.

necessary to remove some of the unstable material from the trench and replace it with crushed rock, concrete cradle, or some other stable material. The method of backfill is the same as for a dry trench, but it may be necessary to backfire with borrow material, in which case the excess unsuitable excavated material must be disposed of.

Rock

Although costly, the construction of sewers in rock has certain definite advantages over construction in other types of soil. Trench walls can be held vertical with no fear of caving and, if the blasting crews are experienced, trench widths can be closely controlled. The trench should be excavated to a depth of 4 to 12 inches below the outside bottom of the pipe, depending on the size of pipe to be installed, and all rock fragments should be removed. Special care should be taken to see that no high spots remain in the trench bottom, as a high spot could easily cause a pipe failure. Table 1 gives bedding and trench width requirements that have been proved satisfactory for various sizes of pipe. Also given is the quantity of bedding material per linear foot of pipe based on the depth of bedding and the allowable trench widths indicated.

The bedding material should be similar to that described for clay trenches. It should be granular sand, sandy gravel, or pea rock, and should allow rapid transmission of ground water through the voids. When ground water is encountered it may be removed by means of a sump pump, because wellpointing is usually impossible. At any rate, the trench should be maintained as dry as possible. It may be desirable to add some of the smaller blasted rock fragments to the bedding material to help sta-

Table 1
Allowable Trench Widths and Required Bedding Material for Sewer Construction in Rock Trench

Inside Pipe Dia., in.	Width of Rock Trench, ft-in.	Depth of Bed,[a] in.	Pipe Bedding,[b] cu ft
10	2-1	4	1.1
12	2-4	4	1.3
15	2-8	4	1.8
18	3-0	6	2.7
24	3-8	6	3.9
30	4-4	8	5.7
36	5-0	8	6.9
42	5-8	8	9.0
48	6-4	8	10.7
54	7-0	8	13.7
60	7-8	8	14.8

[a] Below outside bottom of pipe.
[b] Cubic feet per lineal feet of trench, based on bedding material around bottom third of pipe.

bilize it in a wet trench. The addition of rock fragments must be watched with caution, as it can easily be overdone; it often becomes tempting to the contractor to leave some of the blasted rock fragments in the trench and add the finer bedding material to it. This results, after the construction is complete, in the finer bedding material filtering into the voids of the rock fragments as the water table is again allowed to rise. This condition creates pockets beneath the pipe and can result in unequal settlement, causing the pipe to shift off grade, crack open the joints, or even fracture.

Where hard non-porous rock is encountered special care should be taken in making up the pipe joints to minimize ground water infiltration, regardless of whether ground water is encountered during construction or not. Even when ground water is not encountered during construction, the pipe can be expected to be under a head of water after most rains. The surface water will percolate through the overburden to the top of the rock formation, then flow along the top of the formation to settle in depressions or crevices. A sewer trench blasted in the rock provices an ideal collecting trough for this water.

The backfilling operation in rock is similar to that suggested for clay, except that selected borrow material must be substituted for all excavated rock and the excess blasted rock must be disposed of.

It often is possible in soft sandstones and coral rock to excavate without blasting. When this material is encountered it can be handled with a trenching machine with special buckets to withstand the hard cutting. Here again, widths are easily controlled and walls can be cut with vertical faces. Construction in this type of material is similar to construction in hard clay. The excavated material often will prove suitable for backfilling after the proper bedding has been provided.

Where ground water is encountered in sandstone it can easily be removed by pumping, but in highly porous coral rock it may be practically impossible to lower the water sufficiently to utilize standard construction procedures. When this condition occurs, the sewers may be best installed under water by utilizing divers. In this procedure the trench is first excavated by means of a trenching machine to the required depth. One or two divers are then placed in the trench to place the pea rock bedding material dumped into the trench from wheelbarrows on top, and to install the pipe to proper grade and alignment. Grade and alignment are maintained by a grade string along the top of the trench, and instructions may be called to the divers orally. The divers can hear the instructions clearly even though completely submerged. Although aqualungs have been tried for the diver's air supply, they have proven too bulky and cumbersome to be used in the narrow trenches and have, in most cases, been replaced by a small air compressor on the surface with a hose to the diver's mask. Crews experienced in underwater installation can install a surprising amount of pipe in a day and still maintain close limits on grade and alignment. In coral rock the excavated material is usually used for the backfilling operation; because most of the backfilling is

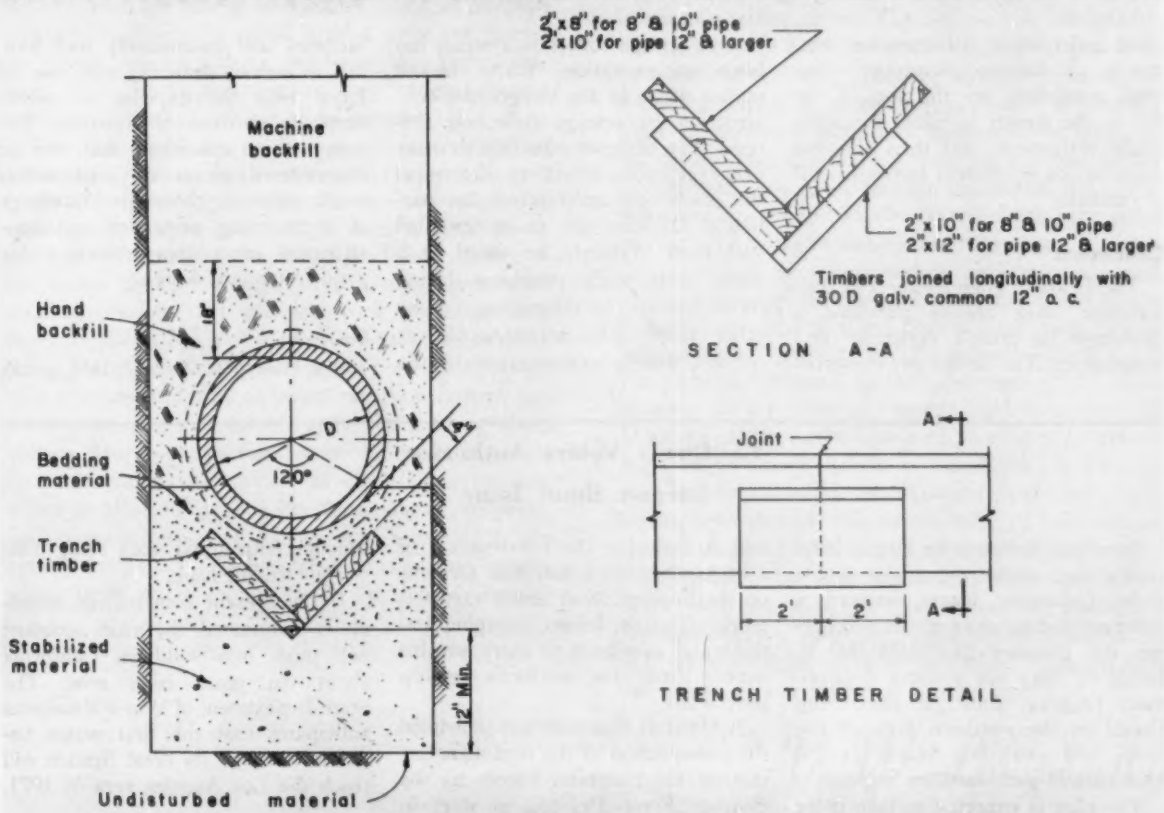


FIG. 4. TYPICAL SECTION showing pipe installation in soft clay trench with unstable trench bottom.

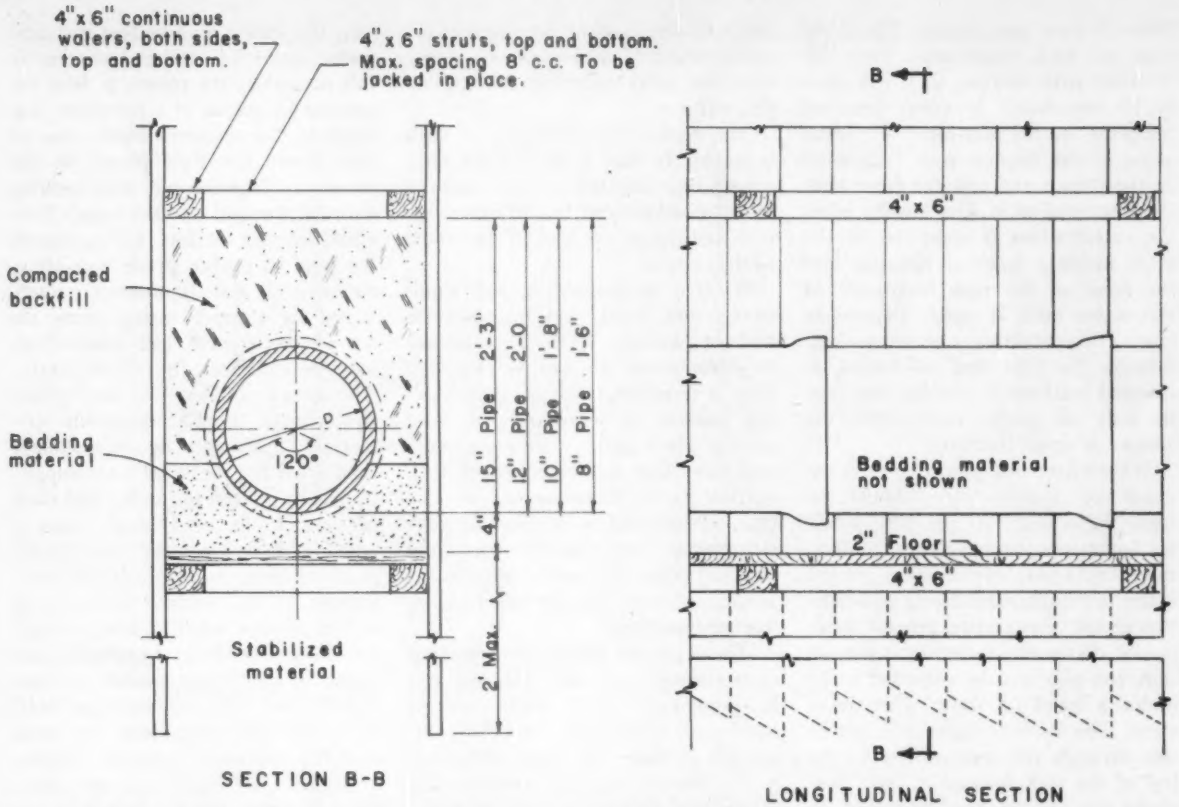


FIG. 5. TYPICAL SECTION showing pipe installation in extremely unstable soil, using solid sheeting and plank trench floor.

done under water, it is common practice to provide no compaction other than mounding up the top of the fill in the trench to allow for some slight settlement, and then allowing construction equipment to run over it at random.

Conclusions

The fields of engineering and construction have always provided a challenge for man's ingenuity and imagination. The design and construction of sewage collection systems has been no exception. Haste indeed makes waste in the design and construction of sewage collection systems. The designer who fails to make every possible effort to determine the conditions under which his particular facilities are to be installed will most certainly be faced with many unnecessary problems during construction. The contractor, on the other hand, who attempts to cut corners during construction of the facilities will undoubtedly find himself in serious difficulty and may be faced with the expense of reconstructing portions of his work. The many varied conditions that may be encountered in sewer construction work makes a thorough knowledge of engineering principles and construction procedures necessary for good economical design.

Reference

1. *Eng. News-Rec.*, Oct. 17, 1957, p. 230.

California Voters Authorize Largest Bond Issue

In what constitutes the largest bond issue ever authorized by a single state, California voters adopted a controversial measure which will permit the issuance $1,750,000,000 in bonds to carry out a water development program aimed at controlling floods in the northern area of the State and providing water to the arid central and southern regions.

The plan is expected to take more than twenty years to be completed, and it calls for the construction of a huge earth-filled dam near Oroville on the Feather River and a vast network of canals, levees, pumping stations and aqueducts to carry surplus waters from the northern regions southward.

A tentative timetable has scheduled the construction of the first aqueduct unit of the program, known as the Feather River Project, to start in the Spring of 1962. This work will coincide with initial work being done on the Oroville Dam.

If the present construction schedule is maintained, the main aqueduct will push into southern California about ten years from now. The State Department of Water Resources anticipates that the first water deliveries through its West Branch will reach the Los Angeles area in 1971.

Editorial

The *First* National Conference on Water Pollution

The heading of this editorial carries the implication that there may be yet another National Conference on Water Pollution. Among the many pre-conference words released about the meeting, there was no hint that another might be held. U. S. Public Health Service Surgeon General Burney sounded the alarm in his remarks to the opening plenary session. He welcomed the conferees to the *first* National Conference on Water Pollution.

Last month we noted that the Conference objectives were two-fold: "obtain substantial agreement on (1) National goals for water pollution control, and (2) the specific programs to reach these goals." It's perhaps a little early to determine whether either of these two goals were achieved, though so many recommendations were made the chances are that at least some of the objectives are sure to be reached. Assistant Surgeon General M. D. Hollis added a third objective during his plenary session address. He hoped that representatives of the diverse organizations could at least become better acquainted as a result of the meeting.

The Conference was, in fact, a sort of combination AWWA-WPCF meeting-in-Washington with invited guests. The invited guests, in this case, tending to be rather vocal in their efforts to get some isolated words changed in the thirty-one recommendations. Some of the words did get changed too, though there were some expressions that attendees were given too little time for discussion and self or affiliation-expression. Some of the comments indicated the presence of people with preconceived notions about pollution control and built-in defense mechanisms against disturbing those notions. However, the Conference did grind out some recommendations, a summary of which is carried elsewhere in this publication. The fact remains, however, that very little was said that had not been said (often better) previously. The fact also remains that conferences alone are not going to do the job of cleaning up our streams, currently a National disgrace. It was intimated in this column last month that words will not clean up the streams, but work will.

Resting somewhere among the thirty-one Conference recommendations is a place where nearly any individual can begin to work, or receive some encouragement to do more than he is doing at present. Consider the need for more public information about pollution abatement. Those of us who spend all of our time in the field of water pollution control are in the best position to do the most constructive work. In our position we can assist in informing the public by being as articulate as we know how among neighbors and friends, speaking about the problem and what needs to be done now, in our own communities. Further, we can volunteer to tell the story, or write it for the local newspaper, radio or television outlets. If training is needed, ask for it, if more trained help is required, ask for it, if increased plant capacity, or improved equipment is necessary ask for it. There is nothing that will get less accomplished than silence. On this the Conference did agree: more work needs to be done toward making the public increasingly aware of the needs in this field.

In addition to recommending an increased public information program, the Conference also recommended "the adoption of a National *Credo*, to be given as wide and consistent publicity as is feasible." Following are the contents, proposed by the Conference: "(1) Users of water do not have an inherent right to polute; (2) Users of public waters have a responsibility for returning them as nearly clean as is technically possible; and (3) Prevention is just as important as control of pollution." Admittedly, this covers a lot of territory and cuts through the thousands of written and spoken, legal, technical and common words, but it does tell the story. Perhaps Congressional action is required to formulate such a statement into a National policy. But if it could be done, perhaps the Second National Conference on Water Pollution can be avoided.

V. W. Langworthy

Water Treatment Plant Reduces Chemical Conveying Costs

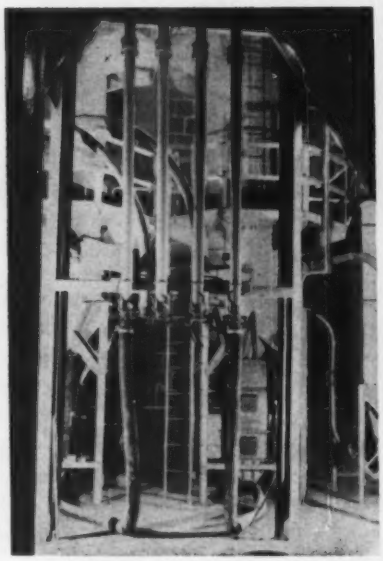
■ AIR CONVEYING at the Brandon, Manitoba water treatment plant has eliminated bag handling, reduced storage costs, and cut chemical costs 22 per cent by permitting bulk buying.

Its new air conveyor system performs two functions: (1) moving lime and soda ash from railroad cars to storage; and (2) transferring these chemicals from storage to feeders for use in the treatment process. Actually, there are two conveyors. One is used for handling soda ash, the other, lime. Both are interchangeable from a maintenance standpoint and can be operated in tandem for fast unloading of either chemical.

Soda ash, for instance can be moved by the system from railroad cars to any of three destinations—either two 60-ton capacity storage silos or directly to the feeders (see diagram). The system also moves the chemical from storage silos to the feeders. The lime conveyor system operates similarly. Both conveyors have dust return lines running to collectors which filter dust, keep it out of the air, and return it to the receivers.

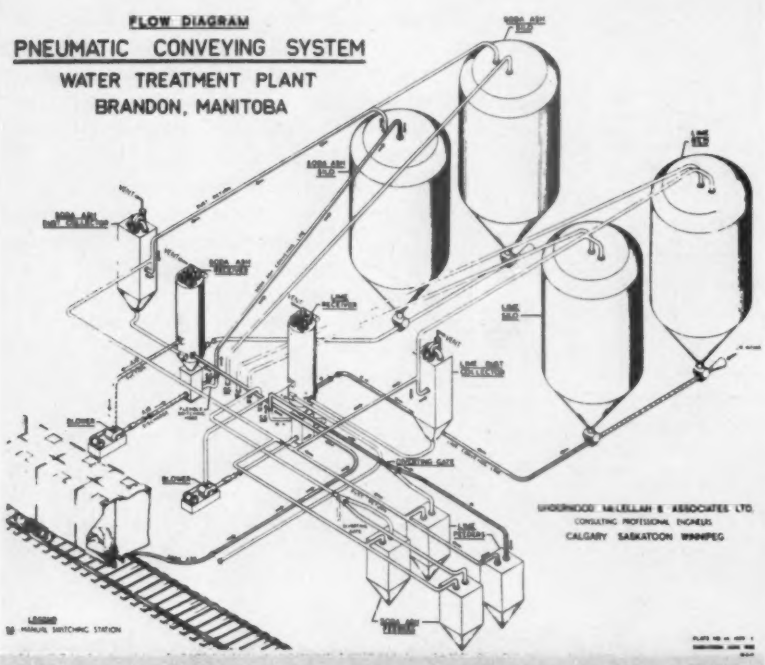
The diverting of material to various areas is accomplished manually at a switching station, where flexible lines from the receivers are attached to any of six conveyor lines. Movement of material from storage to feeders, however, is automatic. Chemicals are drawn from a pre-selected silo to the receiver and are then transferred from receiver to feeder hopper under pressure. The rate of flow is determined by motor-driven rotary feeders on the silo hoppers.

In addition to its economical qualities, the system also provides a fast, efficient, dust-free method of handling large quantities of material. It provides further economies by eliminating loss of chemicals due to bag breakage, and has proved that utilities can bypass high operational costs with modernized bulk handling.



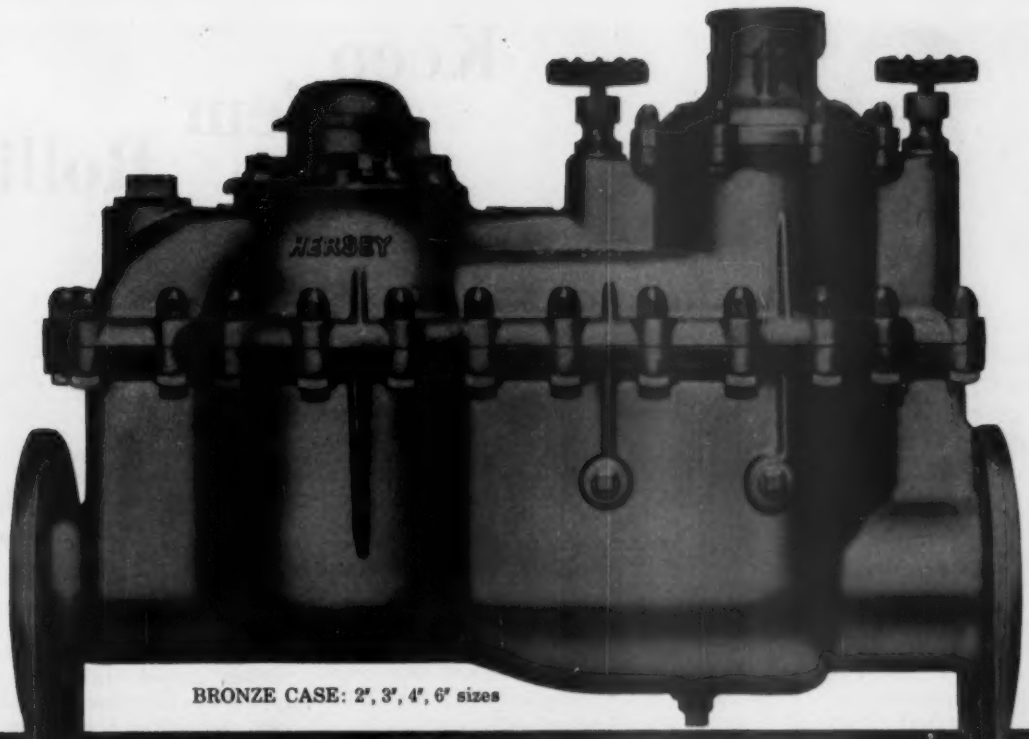
(Courtesy Dracco, Division of Fuller Co.)

Switching station where chemicals are directed to various plant destinations. Only one employee is needed to monitor operation.



(Courtesy Dracco, Division of Fuller Co.)

The airstream conveyor system moves lime and soda ash from railroad cars to storage. Comprised of two conveyors, the system also transfers material from storage to feeders for use in the treatment process



BRONZE CASE: 2", 3", 4", 6" sizes

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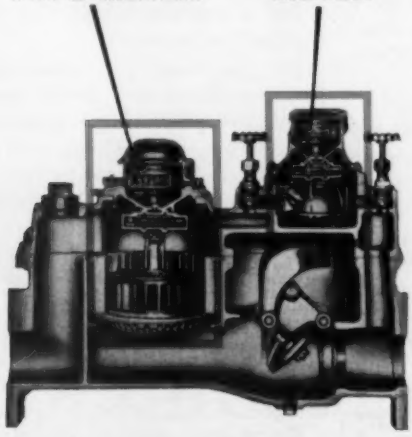

Since 1932 this water meter has been the leader for measuring a wide range of flows. It combines a Current Type Meter (Model T) to measure high rates of flow with a Disc Type Meter (Model HD) to measure low rates of flow. A Hersey Automatic Lever Valve links these meters together, providing an integral device in one casing that accurately measures a larger range of flows than can be accomplished by either type of meter separately. The Automatic Valve is of the compound lever mechanical type which, when opened by a large demand, offers minimum resistance to the flow of water.

The Hersey Compound Meter, Model CT, combines accurate measurement at all rates of flow with a long-time, proved record of minimum maintenance requirements. An exclusive feature is the valves which make it possible to shut off the by-pass meter without closing down the main line meter. Write for more information.

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Keep 'em Rolling

by C. G. Cunningham

A monthly memo providing practical advice on the care of your Department's maintenance and service vehicles.

■ IF YOU DON'T use some type of oil analysis on your water and sewer trucks, your trenchers, tractors, compressors, fleet cars, and every other piece of motor driven equipment in your lot, you are losing money on oil, oil filters and oil change labor.

Most very big cities use a laboratory analysis on oil samples on a test basis, to set up "normal" oil change periods, and to test for engine and mechanical problems.

PICK UP OIL DROPS from hot crankcase. Put two drops on the card, one each on two different types of paper. Wait for oil to dry; evaluate results.

But what about the city water and sewer department that doesn't have that type of money, or is too far away from a lab?

One answer may be the in-shop chemical reaction type of oil analysis. Granted this isn't as scientific as the lab report, but it can give you a systematic method of achieving almost 100 per cent oil utilization without endangering your equipment.

For example: A heavy logging outfit in Lewiston, Idaho had been changing oil on a big stationary engine after 40 hours of operation. They used an oil analysis and found they could extend their change period up to 400 hours. They had been spending 10 times too much on oil, oil filters and oil change labor.

This is an extreme example, but it shows that you're throwing money away if you throw away oil that's still fit for use. There are a number of oil evaluation methods and makes on the market that will work right in your sewer or water department no matter how small.

One of these is the Shell Oil Company's ADC Oilprint Analysis. This system uses a simple chemical reaction principle, a special filter paper, two drops of crankcase oil and an indicator solution. A maintenance man can be taught to use it in an hour. He simply takes two drops of oil from the crankcase of a warmed up engine and put one drop on each of two types of filter paper. The oil diffuses, then is ready to read. It shows three things:

- Whether the oil is too dirty to continue using.
- Whether the oil has glycol, water or other contaminants in it making it ready for a change.
- Whether the oil additives have been used up turning your oil back to acid which means excessive engine wear.

By using some type of an oil analysis and checking each engine every week, you can know almost to the mile when an engine's oil needs to be replaced for any of the three above reasons. This means a saving on oil, and on operating costs.

Remind the drivers of your sewer or water department trucks and on the big dozers, ditchers, and graders that it is very important to idle those big engines for three or four minutes before shutting them off. The bigger the engine, the longer an idle is needed.

EQUIPMENT NEEDED for in-shop oil testing: special indicator, dropper, special wire for collecting oil drop samples, and special filter paper.

Idling, after a hard shift's work, helps reduce the extreme working temperatures generated inside the engine. The larger the engine, the larger the metal mass to contain this heat and the further the heat must travel to reach the atmosphere or the coolant.

A valve can be ruined on a diesel by a quick shut-down when its off its seat, since it is still glowing hot. Residual heat can damage many parts, such as valves, spark plugs, cylinder heads, carburetors and injection pumps. Damage here is due to heat evaporating the lighter ends and leaving gums and deposits.

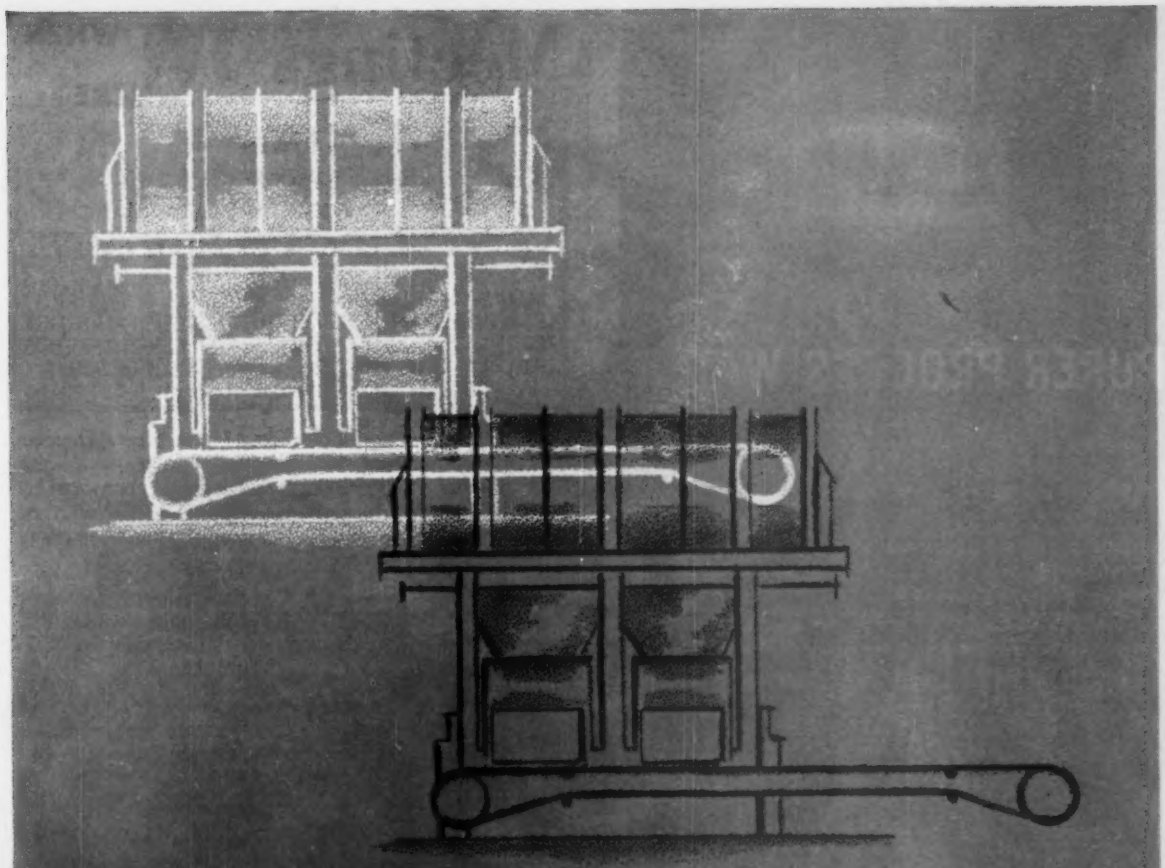
Put a reminder about this point in your driver's bulletin.

Do you brand your truck tires? In some Water and Sewer departments the pilfering of spare tires from sedans and pickups is a real problem. If this is true in your department, why not try branding the tires?

Use two brands. One for your city department, and another one for your log number of that tire. The name brand and numbers will also help you keep track of the tire during use, transfer, recap and more useage.

Brand both sides of the tire for

CONTINUED ON PAGE 92A



NICHOLS "ROTO-PLUG"
lowers installation costs
reduces operating costs

The Nichols "Roto-Plug" Sludge Concentrator lowers installation costs by eliminating expensive vacuum and filtrate equipment, chemical mixing and feeding equipment, and conditioning equipment.

The "Roto-Plug" reduces operating costs because it dewaters sludge "as is", eliminating high chemical conditioning costs and high filter media maintenance.

For full details of the "Roto-Plug" write for a copy of our 4-page folder RP-100.

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We can help you with coagulation and softening, removal of iron and manganese and other water purification problems. **Ferri-Floc** does an outstanding job in producing purer process water, and we have reliable technicians to assist you at any time. Let us send you complete information on **Ferri-Floc**.

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Meetings

WHAT WHEN WHERE

1961

JANUARY							FEBRUARY							MARCH						
S	M	T	W	T	F	S	S	M	T	W	T	F	S	S	M	T	W	T	F	S
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Jan. 23-27—Denver, Colorado (*University Extension Center,* 1100-14*th St.,*) ROCKY MOUNTAIN WATER & SEWAGE PLANT OPERATORS SCHOOL, sponsored by The University of Colorado. Write: Mr. Walter A. Weers, Assoc. Prof. of Civil Engineering, University of Colorado, Denver.

Jan. 24—New York, N. Y. (*Park Sheraton Hotel*) NEW YORK SECTION A.W.W.A. Luncheon Meeting. Secy., Kimball Blanchard, c/o Neptune Meter Co., 22-22 Jackson Ave., Long Island City 1

Jan. 31-Feb. 1—Urbana, Ill. (*University of Ill.*) THIRD SANITARY ENGINEERING CONFERENCE. Subject: Disinfection and Chemical Oxidation in Water & Waste Treatment. Write Ben B. Ewing, Assoc. Prof. of Sanitary Engineering University of Ill., Urbana, Ill.

Feb. 1-3—Indianapolis, Ind. (*Sheraton-Lincoln Hotel*) IND. SECTION A.W.W.A. Secy., Chester H. Canham, State Board of Health, 1330 W. Virginia St., Indianapolis

Feb. 13-17—Cincinnati, Ohio (*Robert A. Taft Sanitary Engineering Center*) Training course "Radioactive Pollutants in Water." Write: Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to PHS Regional Office.

Feb. 20-24—Cincinnati, Ohio (*Robert A. Taft Sanitary Engineering Center*) Training Course "Radionuclides in Water" sponsored by Radiological Health Training Activities. Write: Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to PHS Regional Office.

Feb. 27-Mar. 10—Cincinnati, Ohio (*Robert A. Taft Sanitary Engineering Center*) Training Course "Water Quality Management—Sanitary Engineering Aspects." Write: Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to PHS Regional Office.

Mar. 6-10—Minneapolis, Minn. (*University of Minn. Center for Continuing Study*) COURSE FOR WATER & SEWAGE WORKS OPERATORS. Scott E. Linsley, Secy., Central States Sewage & Industrial Wastes Assn., 2400 Childs Road, St. Paul 6, Minn.

Mar. 10—Jackson, Mississippi (*Robert E. Lee Hotel*) MISSISSIPPI SEWAGE & INDUSTRIAL WASTES ASSN. Secy., Neil G. McMahon, Miss. State Board of Health, Jackson, Miss.

CONTINUED ON PAGE 80A

NOW...A POWERFUL Full-Circle® Clamp Coupling WITH ALL BOLTS ON TOP

SMITH BLAIR INC. ®

TYPE 216

Type 216 for 6-inch Asbestos-Cement Pipe

- All bolts together...
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FOR A QUICK AND PERMANENT INSTALLATION FOR CAST IRON, ASBESTOS-CEMENT, AND STEEL PIPE

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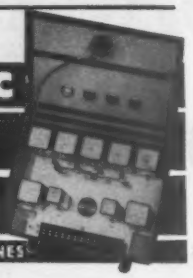
Synchro-Start

FULL AUTOMATIC ENGINE CONTROLS

FOR GASOLINE DIESEL & GAS ENGINES



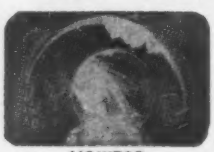
Synchro-Start's new protective engine controls have been designed, for the starting and stopping of engines from remote pilot devices, such as pressure switches, float switches, power failure relays, etc., and are completely automatic in operation.

These dependable controls are encased in a steel, dust proof cabinet, and now feature enclosed PLUG-IN RELAYS as well as OVERLOAD BREAKERS. The plug-in relays simplify what little field maintenance that may have been required in older models, while the overload breakers eliminate the necessity of replacing fuses.

In designing this unit we have used the same high quality materials and workmanship that our customers have come to expect throughout Synchro-Start's 27 years of manufacturing engine controls.

SYNCHRO-START PRODUCTS, INC.
Since 1932
8151 NORTH RIDGEWAY AVENUE • SKOKIE, ILLINOIS

TELEVISION
FOR PIPE INSPECTION



MONITOR

CAMERA

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Pin point trouble spots with our completely automatic Video System.

• **IMMEDIACY**
Positive visual observation and repair automatically upon location.

• **PERMANENT RECORDS**
Technician in our mobile viewing room makes permanent records of conditions.

SALES **SERVICE**

Inspectoline Inc.
CLEVELAND, OHIO

CALL COLLECT
RA 1-7555

WRITE
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Cleveland 6, Ohio

Mar. 12-17—College Station, Texas (*Memorial Student Center*) TEXAS WATER & SEWAGE WORKS ASSN. Secy., G. R. Herzik, Jr., Div. of San. Engr., State Dept. of Health, Austin, Tex.

Mar. 12-17—Texas A. and M. College, ANNUAL TEXAS WATER & SEWAGE WORKS ASSOCIATION SHORT SCHOOL. Secy., G. R. Herzik, Jr., Div. of San. Engr., State Dept. of Health, Austin, Tex.

March 13-24—Cincinnati, Ohio (*Robert A. Taft Sanitary Engineering Center*) Training course "Basic Radiological Health". Write: Chief, Training Program, Robert A. Taft Sanitary Engineering Center, 4676 Columbia Parkway, Cincinnati 26, Ohio, or to PHS Regional Office.

Mar. 15-17—Atlantic City, N. J. (*Traymore Hotel*) NEW JERSEY SEWAGE & INDUSTRIAL WASTES ASSN. Secy., Anthony T. Leahey, P. O. Box 32, West Trenton, N. J.

Mar. 16—Boston, Mass. (*Statler-Hilton Hotel*) NEW ENGLAND SECTION A.W.W.A. Secy., Ralph M. Soule, San. Engr., State Dept. of Public Health, Boston

Mar. 19-22—Little Rock Ark. (*Marion Hotel*) ARKANSAS WATER & SEWAGE CONFERENCE. Secy., Dr. C. W. Oxford, College of Engineering, Univ. of Arkansas, Fayetteville, Ark.

Mar. 22-24—Chicago, Ill. (*LaSalle Hotel*) ILL. SECTION A.W.W.A. Secy., Dewey W. Johnson, Research Engr., Cast Iron Pipe Research Assn., 3440 Prudential Plaza, Chicago 1.

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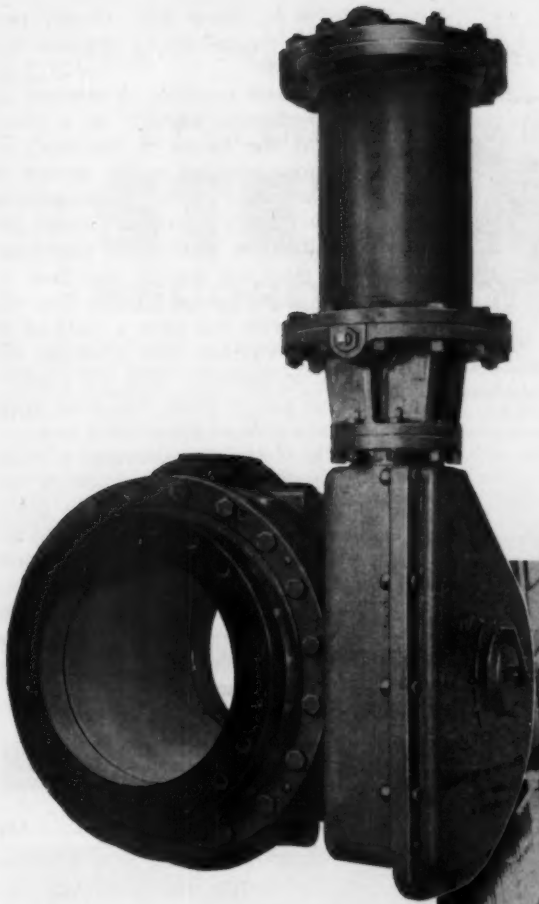

Willamette LIST 26 BALL VALVES

In Kansas City, Missouri, every drop of treated water passes through Willamette Ball Valves in pump check service. Shown above are 5 of 15 Willamette List 26 Ball Valves in automatic pump stop and check service at Secondary Pumping Station. Elsewhere in the system, there are over 120 Willamette Ball Valves in service, including 116 in the distribution grid, in sizes 10" to 42".

Preferred for automatic pump stop and check service, pressure regulating, and strategically located shut-off applications. At present, Willamette Ball Valves are in service in over one hundred cities throughout the country.

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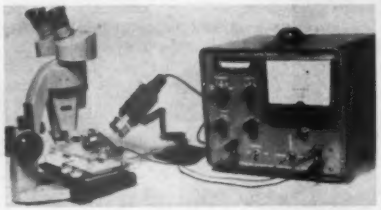
VALVE DIVISION

Willamette VALVES ®

Equipment News

Meter Measures Zeta Potential

101



Komline-Sanderson Engr., Corp., Peapack, N. J., is presently manufacturing and distributing the Zetameter, used for measuring the potential of colloidal particles in liquids. Since this is a practical method of measuring this electric charge, it is possible to treat the liquid with a control additive that will reduce the charge to almost zero, thereby permitting the colloids to coagulate and precipitate.

The zeta potential, determined by electrophoretic mobility, is a measure of the excess or deficiency of electrons attached to the surface of all particulate matter. The magnitude of the charges determine whether colloidally sized particles in suspension will repel one another and thus remain suspended, or whether they will agglomerate and after a build-up in size, precipitate. This principle applies to particles from ultra-microscopic size to those sufficiently large to be visible to the unaided eye.

The Zetameter comprises a minimum, though specific, amount of laboratory equipment needed to determine electrophoretic mobility and the zeta potential. This basic equipment also enables a determination of electrical (specific) conductance which is a simple and practical method of quickly ascertaining changes in raw water characteristics.

the new FORD CATALOG 62

stands out as an interesting, profusely illustrated, latest and most complete book about equipment for setting and testing water meters. A valuable source of information for every water works manager and consulting engineer.

Write for your copy today.

FORD for *better* water services

THE FORD METER BOX COMPANY, INC., Wabash, Indiana

New Coagulant Aid Announced

102

Dearborn Chemical Co., Chicago, Ill., has recently introduced Aquafloc, a new group of coagulant aids designed for more efficient removal of suspended and precipitated solids from water in sedimentation tanks, clarifiers, softeners, or filters.

These aids cause individual particles in water to gather together in the form of dense flocks. As these solids gather into larger heavier masses, they settle faster, filter better and give better water clarity.

Used either alone or with standard coagulants, the new coagulant aids reduce treatment costs while improving results. Included in the product series are: #420, a highly effective non-ionic coagulant aid; #422, which may be used in potable water systems, and #425, which has an anionic form that produces excellent results when floc is positively charged.

All products in the series can be handled without special precautions. They remain stable in storage for a period of at least six months. Since extremely low quantities of these coagulant aids are required for normal applications, they are exceptionally economical to use.

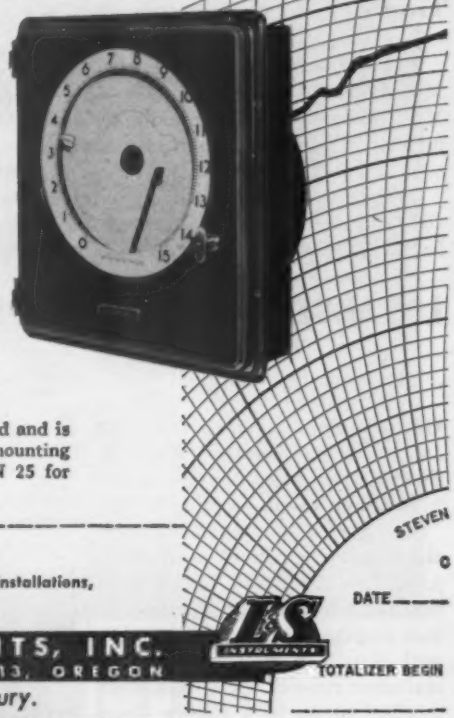
CONTINUED ON PAGE 84A

ACCURATE GRAPHIC AND VISUAL REGISTRATION

of liquid flow with

STEVENS

RECORDER TYPE B-FT



Recording, indicating and totalizing meter for measuring sewage or other flows over Parshall flumes and weirs. This instrument has interchangeable flow cams and flow conversion gears... an important factor to consider for sewage treatment plants in rapidly growing communities. With a simple change of cams and gears the Type B-FT Recorder can operate with a different size flume or accommodate a greater range of flow than that for which it was originally purchased. The change does not require factory service. Similarly, change from weekly to daily time scale, or vice versa, is accomplished by merely repositioning one gear — no new parts to buy.

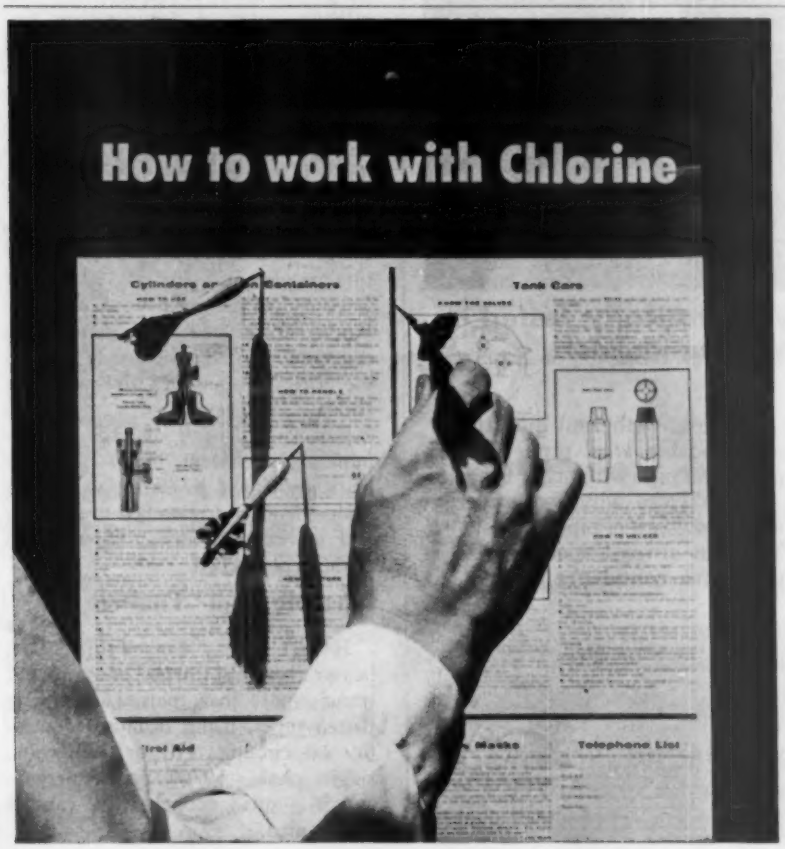
This recorder can be direct float operated or remotely controlled and is available for wall or switchboard mounting, or with cabinet for mounting out of doors directly over the float well. Request BULLETIN 25 for complete details.

STEVENS HYDROGRAPHIC DATA BOOK

Invaluable for your reference file. Contains technical data on recorder installations, plus a wealth of hydraulic and conversion tables. $1 copy. (No COD's)

LEUPOLD & STEVENS INSTRUMENTS, INC.
4445 N. E. GLISAN STREET • PORTLAND 13, OREGON

Specialists in hydrologic instruments for over half a century.



YOU CAN'T PLAY GAMES WITH SAFETY

Before your crew takes that safety chart too lightly, remind them of the consequences of carelessness.

Chemical manufacturers exercise every possible precaution in the packaging, shipping and unloading of hazardous chemicals. And we do everything we can to recommend safe practices among the users of such products. So...

DON'T TAKE CHANCES. If you'd like more copies of our safety charts on products such as chlorine, let us know. There's a 76-page manual available, too. Ask for it.

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Sales Offices: Buffalo, Chicago, Detroit, Los Angeles, New York, Niagara Falls, Philadelphia, Tacoma, Worcester, Mass

In Canada: Hooker Chemicals Limited, North Vancouver, B. C.

Equipment News

CONTINUED FROM PAGE 82A

Bodies for Maintenance Trucks

103

The Powers-American Division, McCabe-Powers Body Co., St. Louis, Mo., has announced an addition to its line of gas and water line construction and maintenance bodies.

The new unit, designated Series 460 and 460-EC, is designated to handle routine and emergency jobs.

It carries all tools needed for gas and water line work, pneumatic pavement breakers and tampers, welding equipment, solvents, lanterns, barricades and other tools and supplies in special compartments and in its 51" x 96" body cargo area.

The body provides as standard equipment shelf partitions and dividers, material hooks, adjustable shelves, recessed door handles, slam-action door catches, keyed-alike cylinder locks, removable endgate, safety tread steel floor, rear stirrup steps and grab handles, super-structure with full length shelves and strap holddowns for tanks.

On the Series 460 Body, an optional air compressor can be installed between the truck cab and body head panel. On the 460-EC, the compressor is mounted in the body proper and is accessible by removable panels.

Other optionals include a compact, winch-type air hoist that handles lifting and dragging jobs as well as the towing of a backfill scraper; an air-hose reel that is installed in the curb-side rear compartment and a water pump that mounts forward of the truck radiator.

System Analyses Silica Concentration

104

Technicon Controls, Inc., Chauncey, N. Y.—For the prevention of dangerous silica concentration in the effluent water of demineralizer systems, an "early warning" chemical analysis system called the AutoAnalyzer has been developed. This automatic system provides a continuous recording of silica concentration down to one part per billion.

Complete automation of demineralizer plants is now made possible with this on-stream system. Through continuous chemical analysis of a small fraction of the effluent water, the AutoAnalyzer spots the rising silica concentration long before it reaches the critical stage and build-up in the boiler.

Not only does it monitor the demineralizer effluent, but it can automatically signal an alarm, switch the system from one resin bed to another, and activate automatic regeneration of the depleted bed.

Portable Pipe Thawer

105

Hobart Bros., Co., Troy, Ohio, has available its Porta-Thaw, a small transformer that permits thawing frozen pipes, using ordinary domestic a-c circuits, 110 or 220 volts, single phase, 50/60 cycle current; and it is small enough to be carried by one man.

LOS ANGELES *chose* STEEL PIPE *with* O-RING JOINT

Granada Pipeline Unit No. 3, built for the Department of Water & Power, City of Los Angeles, is the first major water pipeline to use "High Strength" steel plate with the new O-ring rubber gasket field joint. This 30,000 foot line through the San Fernando Valley, used 32 foot lengths, 49½ in. diameter pipe with ¼ to ⅜ in. wall thickness. Installation time of the O-ring joint proved to be 90% faster than welded joints and permits deflection up to 2° angle and longitudinal movement of at least one inch without leaking. Final hydrostatic tests showed practically 100% watertight at normal pressure.

. . . every length was hydrostatically tested in the shop to AWWA standards!

STRENGTH
TIGHTNESS
ELASTICITY
ECONOMY
LONG LIFE

. . . these are inherent qualities of fabricated *steel* pipe. Compare *steel* pipe with other types . . . you'll see why "wherever water flows, steel pipes it best." You can always specify *steel* pipe with confidence.

For your copy of the latest steel pipe brochure, write—

STEEL PLATE FABRICATORS ASSOCIATION
105 West Madison Street • Chicago 2, Illinois

STEEL PLATE FABRICATORS ASSOCIATION

The transformer is rated at 300 amps, 10 volts on a 100% duty cycle. Four output terminals of long life, bus type provide for three thawing steps, high, medium and low. Operating instructions are permanently mounted in plain view on top of the case.

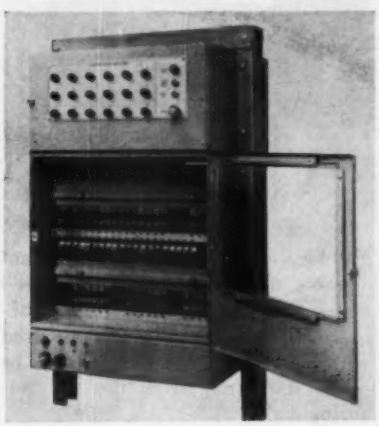
The unit is complete with a 10 ft power cable with plug and receptacle, and two 20 ft thawing cables with lugs and pipe clamps.

Remote Control and Monitoring System

106

Lynch Communication Systems, Inc., San Francisco, Calif., has made available a new solid-state "Electronic Scanning System" designed to provide an entirely new concept of reliability for performing monitoring, alarm and remote station on-off control functions from a central station; thus allowing the completely unattended operation of power substations, pumping plants, pipeline installations and other similar installations.

Designated the B-1000 series, these new systems utilize solid-state circuitry throughout, providing continuous scanning of all functions by purely electronic means, but using no relays or stepping switches and no



motor driven communators or rotating switches.

Byers Enters Steel Pipe Market

107

A. M. Byers Co., Pittsburgh, Pa., announced recently that they will market steel pipe on a national basis. The company has steel pipe immediately available and is prepared to handle orders in a wide range of

CONTINUED ON PAGE 86A

MODEL 2F-II PRATT
Rubber Seat Butterfly Valve

After little more than a year of production, the remarkable acceptance of the Monoflange Mark II design has prompted the addition of a new version—with two flanges. The Model 2F-II features the same rugged construction, the same lifetime seat, and the same unique Sidewinder operators.

Meeting AWWA specifications, the new Model 2F-II will find many waterworks applications for pressures to 150 psi. The size range is from 4″ through 20″. The operators are the unique "Sidewinders," so popular with the Monoflange Mark II.

The savings are significant.

The performance is proven.

The valve is the PRATT Model 2F-II.

Write for details.

Model 2F-II
Butterfly Valve

HENRY PRATT COMPANY
319 WEST VAN BUREN STREET
CHICAGO 7, ILLINOIS

HENRY
PRATT
Creative Engineering for Fluid Systems

Equipment News

CONTINUED FROM PAGE 85A

sizes, finishes, and weights in A53 and A120 pipe grades.

Byers will market their steel pipe through its national sales force and present distributor network as well as new distributors to be appointed.

Byers is, at present, one of the world's largest producers of wrought iron products, and it also sells electric furnace quality steels and PVC pipe. Recently, the firm established a new sales program designed to market additional product lines.

Inventories for the steel pipe will be maintained at Sharon, Pa.

Prefab Joint Sealer

108

Fernco Joint Sealer Co., Ferndale, Mich.—To eliminate the inconvenience and time-consuming tasks of hot pours made in the field, this new prefabricated bituminous joint sealer has been developed. Making a permanent, leakproof seal against roots and soil settlement, it is used to connect crock and cast iron soil pipe, transite pipe, plastic pipe, copper pipe or fibre pipe.

Joints can be easily made in the trench. The pipes are first made reasonably level. Then the joint sealer is placed on spigot end of soil pipe, which, in turn, is inserted into the hub of the vitrified clay pipe. The sealer is pressed in and the job is done. The product comes in a full range of sizes.

Self Balancing Fluorometer

109

G. K. Turner and Assoc., Palo Alto, Calif., is offering a continuous recording fluorometer which is self balancing and will operate the customer's standard records, most of which require 0-1 mv input, although other signals are available on request.

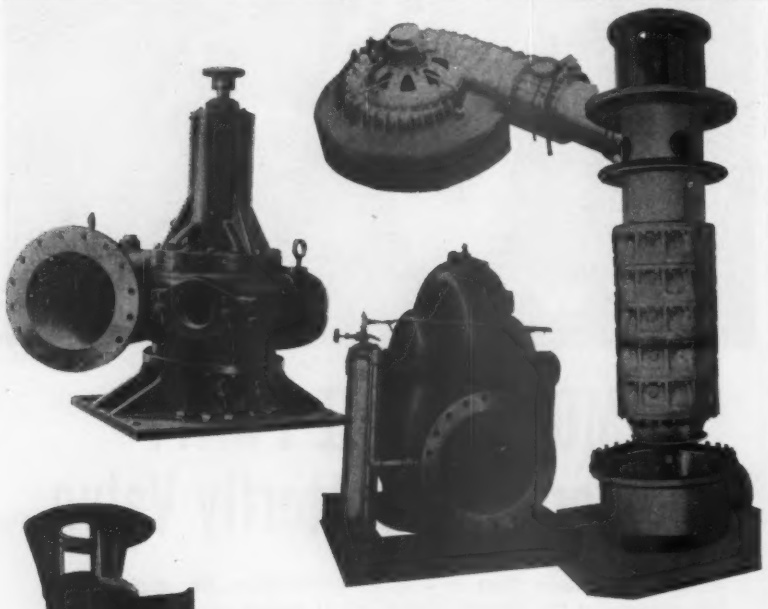
The instrument is particularly designed for applications where fluorescence or turbidity must be measured continuously as in chromato-

graphic column effluents, plant streams, detection of oil in boiler feed water, and in water or air flow tracing. Although it normally is used with a recorder, readings can be made, if desired, from the self balancing dial.

Mill Ruptures Microorganisms in Quantity

110

Gifford-Wood Co., Hudson, N. Y., has developed a new mill especially designed and constructed for rupturing large quanties of microorganisms. Designated the "Eppenbach Micro-Mill," the unit will reduce slurries and bacteria, spores, molds, yeast, and pollen granules in hopper capacities ranging from 150 ml to



SPEAKING OF PUMPS!

Specifying or buying pumps is a big responsibility. You must be sure the pump you select will operate efficiently, economically and dependably "around-the-clock" or in emergencies.

C. H. Wheeler can help you! We make the type pump you need—centrifugal, mixed or axial flow, both horizontal and vertical—in a wide range of capacities and heads.

Also, we can assist you in designing your pump installation, whether it be for municipal or industrial water supply, sewage, drainage, irrigation, flood control, fire protection, heating, air conditioning, or steam power plant services.

We've been designing and manufacturing quality pumps for almost three quarters of a century, so you know when you specify or buy C. H. Wheeler pumps, you can depend on them. Consult your local representative or write for more information.

C. H. WHEELER MFG. CO.

19th and Lehigh Avenue, Philadelphia 32, Pa.

Centrifugal, Axial and Mixed Flow Pumps • Steam Condensers • Steam Jet Vacuum Equipment • Marine Auxiliary Machinery • Nuclear Components

2 liters. Capacities up to 5 gallons are available and larger sizes can be made on special order.

The mill is powered by a 1.5 hp AC-DC motor with speed controls from 0 to 10,000 rpm monitored by a continuously variable transformer. The entire unit is mounted on a stainless steel dolly for portability and ease of installation and use.

Continuous Flow Air Charger

111

Nielsen Manufacturing Co., Oakland, Calif., offers a new approach to the problem of introducing desirable volumes of air or other gases to pressure systems. Operating through the vacuum generated by a patented venturi action, the new Air Charger provides a continuous metering of air or other gases into any pipeline carrying a flow of liquid under pressure.

The unit can handle the requirements of water pressure systems having a storage capacity of more than 2,000 gallons. Other applications include sewage treatment plants, refrigeration cooling towers and some processing complexes.

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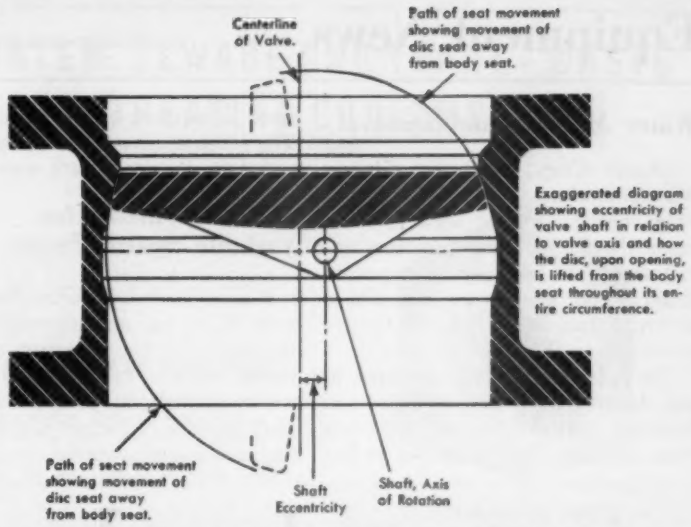

Centerline of Valve.
Path of seat movement showing movement of disc seat away from body seat.
Exaggerated diagram showing eccentricity of valve shaft in relation to valve axis and how the disc, upon opening, is lifted from the body seat throughout its entire circumference.
Path of seat movement showing movement of disc seat away from body seat.
Shaft Eccentricity
Shaft, Axis of Rotation

HOW DARLING-PELTON BUTTERFLY VALVES

lick common problems!

Problem No. 1—COMPLETE SHUTOFF. With a continuous, 360 degree, rubber sealing ring, uninterrupted by the valve shaft, *drop-tight* shutoff becomes possible!

Problem No. 2—SEAT LIFE. With the valve disc swinging on an axis eccentric to the valve centerline, the disc lifts away from the body seat upon opening—abrasion and distortion are avoided. Moreover seat life is further prolonged by easy, compensative adjustment.

Problem No. 3—MAINTENANCE. Maintenance is minimized and simplified due to the unique seat ring principle. No sealing problem around the shaft. The rubber seat is replaceable in or out of the line without dismantling the valve!

Get *all* the facts on performance and sizes. Made to A.W.W.A. Specifications. Send for Bulletin 5904.

DARLING VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 11, Pa.

Manufactured in Canada by
The Canada Valve & Hydrant Co., Ltd., Brantford, Ont.

Equipment News

CONTINUED FROM PAGE 87A

Water Meter Scale Removal

112

Skosal Corp., Webster Groves, Mo., announces the availability of a mild chemical solvent used to overcome the hazards and problems encountered in descaling all types of water meter equipment, and where accuracy has been reduced by restrictions to the flow of water.

The solvent eliminates the need to use destructive acids and their concomitant fumes. After the scale has been removed, only a rinsing in hot water is required before re-assembly. The solution may be used repeatedly and does not deteriorate with age.

Special Controls for Variable Speed Pumps

113

Morris Machine Works, Baldwinsville, N.Y., has announced it is able to boost the line pressure of their double-suction, centrifugal pumps while maintaining pressure at constant value with the use of the Westinghouse Rectiflow drive.

In usual practice, the variable speeds of standard wound rotors are controlled by adding resistors to the armature circuit. This, practice, however, causes power loss. The new Rectiflow drive thus replaces resistors with rectifiers. The resulting d-c current feeds into a d-c motor which supplements the shaft torque, maintains full power, and increases the efficency of the pump.

The discharge output of these pumps is set for constant, but the suction pressures are allowed to vary.

All-Steel Building for Municipal Needs

114

Martin Steel Corp., Mansfield, Ohio—Small towns across the nation, faced with today's increased needs for additional municipal offices, utility storage and space for other facilities, will find a ready solution in low-cost building expansion with the new Spartan, an economical multi-purpose building.

Designed for fast, easy assembly anywhere, this unit is a sound, sturdy structure requiring little maintenance. It is easily adaptable for office use, equipment and other storage, garage or general workshop, engineering and water works or power equipment housing . . . . making a convenient serviceable building in itself or as an annex to existing buildings.

Planned to conform to most building codes, it has a standard wind and roof load (12-pound snow load and 15-pound wind load), and there is a heavier model with a 30-pound snow load and a 20-pound wind load.

Sliding or walk-in doors may be had in any desired combination, as well as a wide choice of windows, skylights and ventilators to fit individual needs. The unit is available in widths of 12 ft. multiples, enabling a building up to 72 ft. wide. Lengths start at 32 ft. and come in 16 ft. increments to give any desired length. There are three basic heights: 10, 12 and 14 ft.

control

for algae and aquatic weeds

In small amounts, Triangle Brand Copper Sulfate controls algae growth and kills some of the more troublesome aquatic weeds. They disintegrate where they are, which prevents downstream infestation or clogged waterways.

In sewage pipes, Triangle Brand Copper Sulfate can be used in such low concentrations to control root and fungus growth that surface trees remain unaffected.

Two informational booklets, "The Use of Copper Sulfate in the Control of Microscopic Organisms," and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains," available on request.

Phelps Dodge Refining Corp.
300 PARK AVENUE, NEW YORK 22, N. Y.

Pre-Shaped Saddle Fittings

115

Allied Piping Products Co., Inc., Salem, Ohio, announces that pre-shaped saddle fittings are now available in 45° angles. Until now, the bulk of the company's production had gone to pre-shaped 90° saddle fittings.

Manufactured of high strength seamless tubing in three weight schedules, the new fittings come in A-53 for most piping requirements and A-106, Grade B for higher pressure applications. Grade A-106 can be delivered with mill test certificate if requested. Sizes range from 1" through 12" for welding and 1" through 4" for threaded filling. All are beveled for welding. Special fittings 1" through 36" in aluminum, alloy or stainless steel are available in any desired angle.

Installation of pre-shaped fittings is accomplished in three steps, marking, cutting, and welding. They are designed to be leakproof, strong, lightweight and easy to handle, and to be used in conjunction with existing holecutting equipment, thus offering a solution to the problem of reducing the high cost of pipe fabrication.

Mountings for Meter Boxes

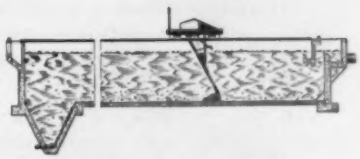
116

Ford Meter Box Co., Inc., Wabash, Ind., announces the availability of two new pack joint couplings which permit 1½ in. and 2 in. flange meters which may be adjusted in space without threading or soldering.

A rubber gasket is sealed against the outer wall of the pipe with a compression nut at whatever point is required for the proper spacing of the meter. The joint is then locked to iron pipe with stainless steel set screws and to the copper pipe with an integral clamp.

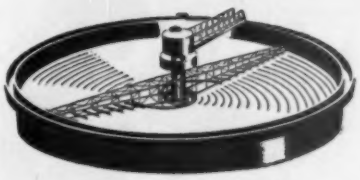
CONTINUED ON PAGE 90A

WATER, SEWAGE AND TRADE-WASTE TREATING EQUIPMENT



RECTANGULAR CLARIFIERS

Especially suited for limited spaces or where sludge delivery is desired at one end of the tank. A traveling scraper and skimmer carriage removes settled solids from the tank bottom and scum from the top.

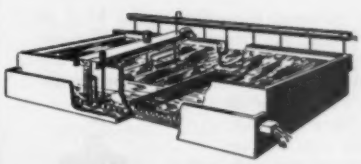


CIRCULAR CLARIFIERS

Hardinge Circular Clarifiers are available in sizes up to 200' diameter, either center-column or beam supported for steel, concrete, wood or tile tanks. Sludge scrapers remove settled solids rapidly through central underflow discharge.

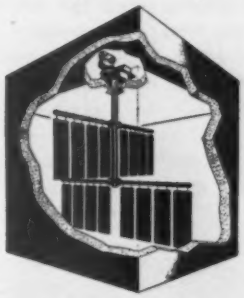
HYDRO-CLASSIFIERS

A large-volume classifier for rapid separation of coarse and fine suspended solids. Frequently used for by-product recovery from waste water.



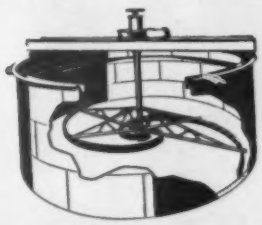
AUTOMATIC BACKWASH FILTERS

For high removal of non-settling or slow settling suspended matter. Self-cleaning sand bed. No shut-down necessary for backwashing. Traveling backwash mechanism.



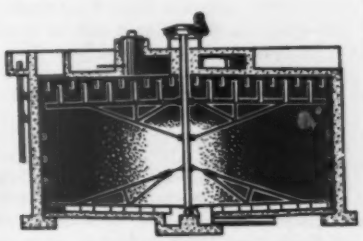
FLOCCULATING UNITS

Slowly rotating paddles on vertical shafts bring the small flocs into contact to form larger masses and hasten precipitation.



"AUTO-RAISE" THICKNESS

For removal of fine suspended solids from supply water, waste water and sewage. "Auto-Raise" mechanism prevents scraper breakage. Manual or power raise supplements "Auto-Raise." Replacable ring-type ball bearing support for rotating mechanism. Spiral rakes for maximum underflow density.



DIGESTERS

Sludge scrapers and scum breaker arms prevent scum accumulation, insure uniform gas production. Emit a dense digested sludge.

Write for Bulletin 35-D-15

HARDINGE

COMPANY, INCORPORATED

Main Office and Works • 240 Arch St., York, Pa.

"Hardinge Equipment—Built Better to Last Longer."

NEW YORK
TORONTO
CHICAGO
HIBBING
SALT LAKE CITY
SAN FRANCISCO
HOUSTON
LAKELAND
BIRMINGHAM

Equipment News

CONTINUED FROM PAGE 89A

Four Compact Receivers Added to Telemetering Line

117

B-I-F Industries, Providence, R.I., has announced the addition of four new compact receivers to its line of telemetering instruments: a single function indicator; a dual function indicator; an indicator/totalizer; and a panel mounted totalizer.

These units are designed so they will never need lubrication. They have large, clear graduations and numerals for easy, "at a glance" reading through clear plastic doors, and all are designed for mounting in panels up to ⅞ in. thick with a cut-out 6⅛ in. square. Indicator scales read directly in desired units with use of decimal multipliers; calibration accuracy is ±0.5% of scale span.

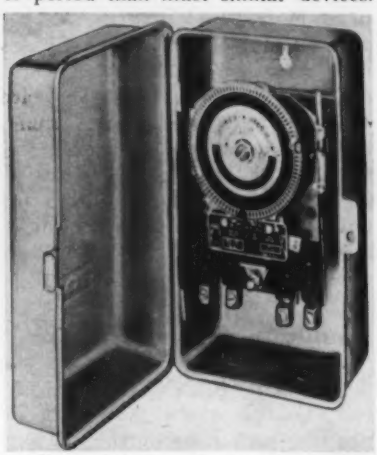
The new receivers are of plug-in, modular design with etched circuits, providing for easy future expansion They also have the new Power Positioner with its balanced-movement design for high speed operation, operating in any position and available in four time cycles. Rather than relays, this new low-voltage transmission system uses transistor switches.

The following alarm or control switches, as optional extras, can be combined in each instrument: 2 to 8 control or alarm switches; 2 to 6 control or alarm switches and a potentiometer; or simply a potentiometer for summation or readout.

14-Day Time Switch

118

Tork Time Controls, Inc., Mount Vernon, N. Y., are offering a 14-day time switch that "works" but once a week. It is used to turn a motor on one week and off the next, thus allowing pumps, motors and other equipment to "rest" one week, a longer period than must similar devices.



The switch is a single pole, double-throw time switch. Its dial makes a complete revolution in 14 days. Every 7 days, the unit "make-breaks" to put one set of equipment on and the other off.

Controlled Filtration Plant

119

Project Fabrication Corp., College Point, N. Y., has made available an odorless, maintenance free, high capacity, controlled filtration plant for waste purification.

The plant is furnished in a wide range of capacities and sizes to handle small as well as large waste loadings. A 2 x 2 x 2 ft plant will handle the daily sanitary waste of 600 people, and 8 x 8 x 24 ft plant will serve the daily waste of 2,500 people.

Custom fabricated to meet user requirements and constructed of aluminum, the plant is shipped completely shop assembled and ready to operate.

the Priceless Ingredient

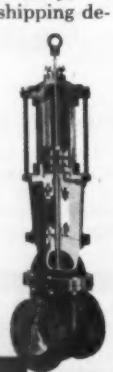
The priceless ingredient theme originally was applied to medicines, and is not new. But it can be applied to other products – even valves. Of course, the priceless ingredient in a product is an invisible force, with neither shape nor form. Yet this intangible element has set M & H apart in its field and is a prime reason for the Company's growth and prestige.

This priceless ingredient is the personal integrity of the M & H organization – the engineer with his problem of design, the procurement personnel who select raw materials, the chemist in his laboratory, the core maker, the moulder, the machinist, the inspector, the shipping department, the sales personnel, the management. Each man takes personal pride in his individual contribution to the job of furnishing you a top-quality M & H Valve or Hydrant – one or a carload.

The integrity of these individuals is priceless –because it is not for sale and cannot be bought. It is the extra ingredient which is responsible for placing M & H in the forefront of the American valve and hydrant industry.

It is one of the prime reasons for the superior quality of M & H valves and hydrants which appeals so strongly to engineers, utility men and industrial operators.

(No. 8 of a Series)



M&H VALVE AND FITTINGS COMPANY
ANNISTON, ALABAMA
SUBSIDIARY OF WALWORTH

News of Suppliers

F. G. Merckel Dies

Wallace and Tiernan, Inc., Belleville, N. J., regretfully announces the death of Frederick G. Merckel, Director and retired President of the company. He was 64 years old.

Mr. Merckel joined the company in 1921 and was assigned to the Kansas City office. Later that year, he was sent to Shanghai to supervise the installation of a new water filtration plant. During the next 23 years, he participated in almost every phase of the company's business activity.

On January 1, 1954, when the company became a publicly owned firm, Mr. Merckel was elected to the office of President. He served in that capacity for the next five years, which was the limit he had set for his tenure.

Mr. Merckel was a life member of the AWWA, a fellow of the American Public Health Association, and a member of the Executive Committee of the World Health Organization.

Films Show Safe Handling of Chemicals

Dow Chemical Co., Midland, Mich., has announced the availability of four educational safety films each dealing with the proper handling of certain chemicals. The films are titled: "Handling Caustic Soda Safely"; "Handling Chlorine Safely"; "Handling Chlorinated Solvents Safely"; and "Handling Muriatic Acid Safely".

Each film is a 35mm four-color sound slide that runs about 12 minutes. The films explain the nature of the chemical involved, points out the hazards of the material, and then gives a step-by-step procedure on the proper methods and techniques that should be followed when working with the chemical.

The films are available free-of-charge on a "loan out" basis.

It's true they existed, though you may not recall . . . the good ole' days of the one hoss shay, gas lights, pistol packin' mamas and McGinty's—where red eye, pink garters and black magic ruled the roost. Yes sir, the boys really whooped it up when Igor the Marvelous plied his talents with trick cards, disappearing lassies and similar quicker-than-the-eye hocus pocus.

But nowadays, another type of legerdemain has caught the public's fancy. It's KAUL Presto-SEAL clay pipe with factory-molded precision-cast polyester spigots and sockets that *joint like magic*. A rubber gasket, permanently imbedded in the socket, where it belongs, is the key to this pipe joining wizardry. When installed Presto-SEAL is completely impervious to root penetration, and performance standards are far above the most rigid infiltration-exfiltration requirements.

Engineers, contractors and public works officials throughout the country have been loud in their praise of this revolutionary improvement for sewage and drainage systems. On job after job—on any terrain—even under water, it's been proved that KAUL Presto-SEAL clay pipe is trouble free under exacting tests . . . can be laid faster . . . saves upwards to 50% in time and labor costs.

Want to be shown? Ask for free demonstration, a trial Presto-SEAL installation, or write now for complete specifications.

Manufactured to A.S.T.M. Specifications,
Presto-SEAL is available in a complete range of sizes
from 4" to 36", both standard and extra strength, with matching fittings.

*T.M. Reg.

KAUL clay company
TORONTO, OHIO • U. S. A.
"Exclusive manufacturer of Presto-SEAL pipe that joints like magic"

A list of Manufacturers

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Note: We wish to thank the many manufacturers who kindly furnished pictures and illustrations for the W & S W Annual Photo Equipment Review.

Because of the very large number of interesting pictures sent us, next month W & S W will publish a kind of "Junior" edition or addenda to this regular January feature.

For further information on products or services, please use reader service card.

A Whiff of Visitors

Continued from page 24

look at that waistline, ought to diet a bit shouldn't he. Better insure them through the post; we don't want to be accused of debagging the man. Any valuables in the pockets?" "What's that you've got there? Hey —my *best* eraser in *his* pocket! The thieving individual—you can't trust any of these fellows around—just look at that, they've got hundreds of erasers like that up at Head Office and here they go filching my one and only. No. You send those trousers back C.O.D., and bag those matches too, we can't send them through the post."

Tut, tut. These careless engineers! I think I need to see some practical men out on the site. Where's my cap? Who has got my cap? I left it there earlier on the . . . .

Keep 'em Rolling

Continued from page 76A

easy identification. One trucking firm brands midway between the sidewall center and the tread edge. They go 1/16th of an inch deep. These are almost impossible to buff out or grind off.

In gas engines where detonation or "pinging" occurs, even though spark timing is correct and the right grade of fuel is being used, combustion chamber deposits may be the fault.

Champion Spark Plug people advise that these deposits, which accumulate as engine mileage increases, may form to such an extent that the compression ratio of the engine is increased.

The rate and types of carbon accumulation obviously depends on the fuels and engine oils used as well as operating conditions and driver habits. However, once detected, the deposits can be removed with an approved combustion chamber cleaner.

The use of such a product, coupled with regular tune-ups, will restore engine performance and efficiency.

New Literature

AVAILABLE FREE

Sewage Sludge Concentrator
120

Nichols Engr. and Research Corp., New York, N. Y., is offering a 4-page bulletin that describes its Roto-Plug sludge concentrator that thickens and dewaters both sewage and industrial sludges without the use of chemicals.

A cutaway drawing illustrates the construction of the unit and on-the-job photographs depict it in operation. A list of the unit's general specifications is also included.

Air Valves For Pipe lines
121

Multiplex Manufacturing Co., Berwick, Pa., is offering its recently published 28-page catalog that gives a comprehensive presentation of their Crispin line of air valves used to control the amount of air in liquid carrying pipelines.

Filtration plants, sewage disposal plants, reservoirs, pumping stations, and power plants are among the various services that use this product. The particular application of these valves is explained in the catalog, and each type is illustrated by a cutaway drawing.

Further information on the operation, construction and performance of the valves is provided by charts, tables and graphs. Dimensional data are also included.

Purification Systems
122

American Schreiber Co., York, Pa., is distributing a 6-page folder illustrating and describing its method of assembling predesigned biological sewage treatment plants from concrete blocks and prefabricated components.

The folder is illustrated with photographs and color diagrams of: a compact, complete sewage treatment plant; multiple septic tank systems; Imhoff Tank Systems; and a trickling filter plant embodying settling, high rate filters and digestion tanks in a single unit.

Sewer Pipe Joints
123

L. A. Weston Company, Adams, Mass., is offering literature that describes their recommendations for making a more secure and efficient sewer pipe joint with cement; a joint that is tight and which minimizes root intrusion and still provides a good alignment of the joint.

The procedure also allows the worker to construct joints in water-bearing trenches.

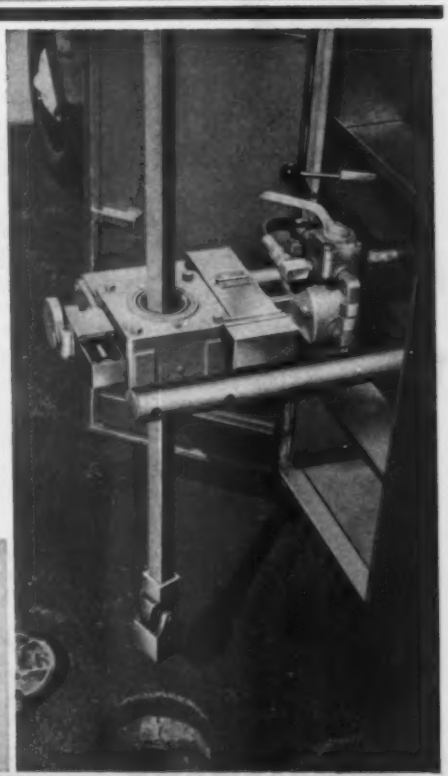
Electronic Data Processing for Small Utilities
124

Remington Rand Division, Sperry Rand Corp., New York, N. Y., explains how smaller utilities can gain the advantages of electronic data processing in a new brochure just published.

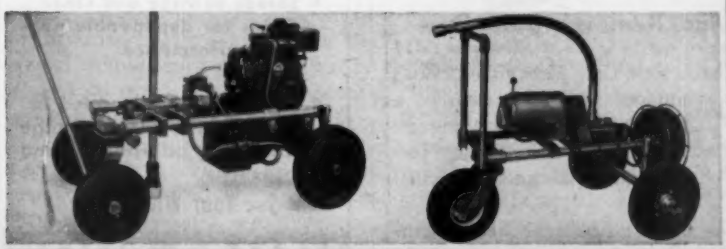
Through the use of Univac Service Centers, small utility companies can make use of modern electronic billing heretofore available only to larger firms. These centers are designed to serve small companies who find it impractical to invest in or even rent the necessary equipment.

CONTINUED ON PAGE 94A

HYDRAULIC TRUCK MOUNTED VALVE OPERATORS PROVIDE ONE MAN CONTROL OF VALVES FROM 10" TO 60" SHIPPED FULLY ASSEMBLED, FOR MOUNTING IN ANY MAKE OF TRUCK BY YOUR OWN MECHANICS, WITHIN A FEW HOURS. HAS SAFETY DEVICE FOR DAMAGE PROTECTION ALSO POSITION INDICATOR.



PORTABLE 3-10 HP. ELECTRIC DRIVE

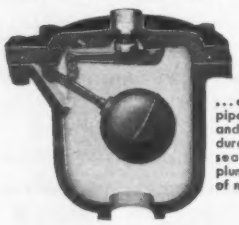


Makes EVERY VALVE Power Operated. Payne Dean & Co. Clinton, Conn.

Crispin

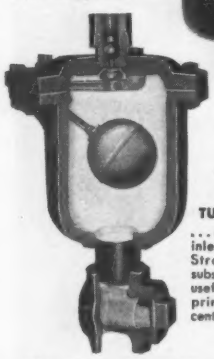
AIR VALVES
are thoroughly
dependable

For positive air control use Crispin Air Valves. Simplified construction, easy accessibility, maximum dependability, minimum maintenance, and efficient operation are advantages built in every Crispin Air Valve.



Crispin
MODEL "P"
AIR VALVES
...eliminate air in pipelines, pumps, tanks and other vessels—durable stainless steel seat and synthetic plunger resist attack of many liquids.

Crispin
DUAL VALVES
...safely release air during line filling and while it is in operation, permit air to enter as line is emptied—low-cost 3-way control.



Crispin
TURBINE VALVES
...control air from inlet through outlet. Strains out foreign substances. Particularly useful with automatic priming systems of centrifugal pumps.

Write, wire or phone for complete information on dependable Crispin Air Valves that keep your pipelines open for safe, economical operation.

AIR CONTROL VALVES FOR OVER 50 YEARS
multiplex
MANUFACTURING COMPANY
BERWICK, PENNSYLVANIA
Dept. B

New Literature

CONTINUED FROM PAGE 93A

Pressure and Liquid Level Transmitter

125

Conoflow Corp., Philadelphia, Pa., has issued a new bulletin on its Model P pressure and liquid level transmitter. The bulletin describes the unit as an inexpensive yet durable instrument capable of measuring pressures as high as 250 psi or ranges from as low as 0 to 100 inches of water.

Also shown are typical applications of the unit as a pressure transmitter and as a liquid level transmitter. The bulletin illustrates exclusive design features, such as the complete separation of the measuring diaphragm from the pneumatic pilot which prevents process liquids and gases from backing up into air lines and damaging costly instruments.

Control Valve Catalog

126

General Kinetics Corp., Englewood, N. J., has issued a new, 16-page catalog describing its P-K Paul control valves which has an exclusive venturi-ball design. The catalog presents engineering, specifications and purchasing information on the complete line of cast, barstock, and special valves, which are supplied in sizes from ¼-inch to 14 inches, for pressures from high vacuum to 50,000 psi, and temperatures from —425° F to 1800° F.

The valves are supplied with all types of control and positioning equipment and are suitable for the control of virtually all types of liquids, gases, vapors and slurries.

Sludge Removal Bulletin

127

Chain Belt Co., Milwaukee, Wis., has announced the publication of a new 12-page bulletin describing its Rex Unitube Tow-Bro, sludge remover for industrial and municipal use.

The bulletin outlines why the Unitube design allows a saving of 20 per cent or more in equipment costs as compared to the previous nozzle and arm design, and explains why

It's NEW for HEAVY-DUTY SEWAGE USES

KENCO®

HIGH CAPACITY 8600 GPH
at
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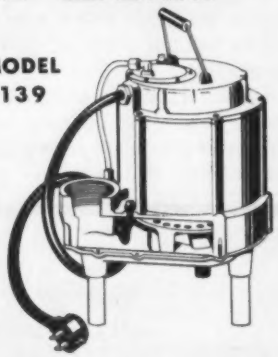

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the Tow-Bro principle provides a more rapid sludge removal.

In addition, the bulletin features a 4-page photographic section which illustrates the adaptability of the Tow-Bro to any size or type of tank for uniform and positive performance.

Elevated Steel Tanks

128

Pittsburgh-Des Moines Steel Co., Pittsburgh, Pa., has published a new, 20-page elevated steel tank brochure which describes a wide selection of tanks engineered and fabricated for various water storage applications.

Special sections are devoted to double ellipsoidal, ToroSpherical and radial cone bottom designs. Numerous photographs illustrate the overall appearance, and accompanying tables and diagrams show the capacity, diameter, head range and number of columns.

The bulletin also includes data on various pedestal spheroids and pedestal sphere tanks, the WaterBall, standard and optional accessory equipment, and industrial tanks for fire protection.

Eccentric Plug Valve

129

W-K-M, Div. of ACF Industries, Inc., Houston, Texas, is offering a 4-page bulletin that explains and illustrates the main features of its eccentric plug valve designed for flow control in sewage plants and water works.

A series of tables provides construction and performance data of the unit which is available wrench or worm gear operated.

Protective Coatings

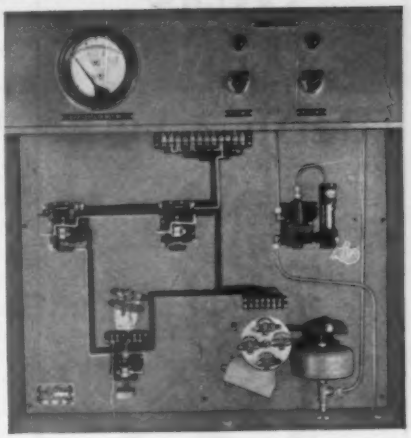
130

Koppers Co., Inc., Pittsburgh, Pa., announces the publication of an 8-page bulletin describing the properties and applications of its Bitumastic Cold-Applied protective coatings. These coatings may be applied by brush, spray or roller and are designed to meet such problems as underground corrosion, water exposure and corrosive atmospheres.

In addition to providing specification data on nine major Bitumastic products, the bulletin lists numerous installations where a corrosive protection was required; a list of recommended coatings is also included.

CONTINUED ON PAGE 96A

PRESSURE-OPERATED SUMP CONTROL



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New Literature

CONTINUED FROM PAGE 95A

Permanent Cast Couplings

131

Smith-Blair, Inc., South San Francisco, Calif., has issued a 12-page booklet that describes and illustrates its complete line of cast couplings for all classes and sizes of cast iron or asbestos-cement pipe, including cast insulating couplings for electrolytic conditions and a special cast "cut-in" coupling for repairing broken and deflected pipe.

The couplings and the method of installation are illustrated by both photographs and drawings. Tables provide technical information and a list of specifications is included.

Portable Water Analysis Equipment

132

Hach Co., Ames, Iowa, has recently released a 31-page catalog that provides a listing, with appropriate descriptions, of its line of water analysis kits.

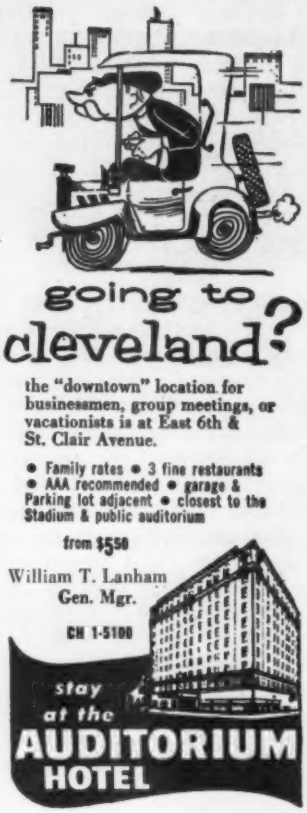
The main units are pictures and the chemical or conditions for which the kit is designed to test is listed together with the range of analysis. Also included in the literature is an explanation of how the kits should be used and other operating data.

Compact Sewage Treatment Plant

133

Walker Process Equipment, Inc., Aurora, Ill., recently made available its 12-page bulletin that describes its Sparjair packaged sewage treatment units designed for such confined locations as residential areas, shopping areas and schools.

Numerous diagrams illustrate the construction and operation of the unit, and tables list the specifications in detail. Photographs show the units in various installations; the text describes the unit and its principal features.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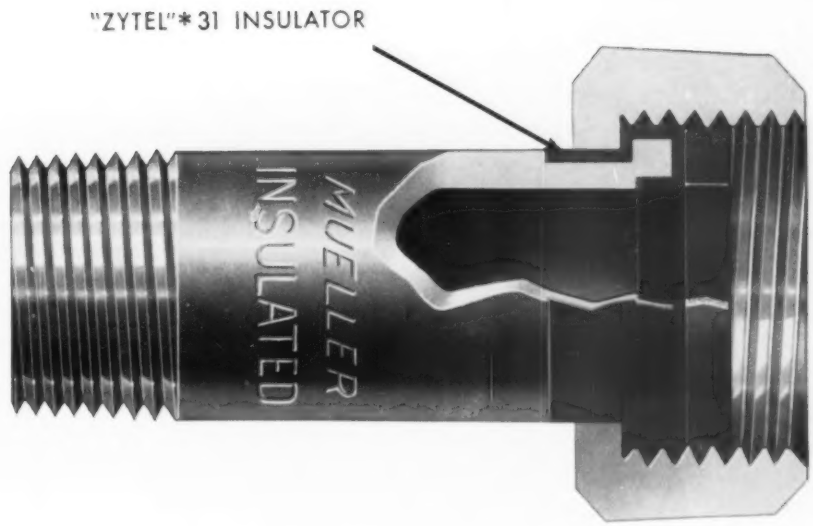

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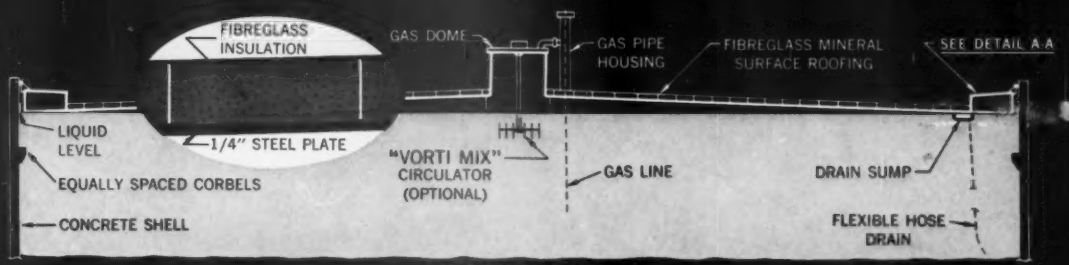

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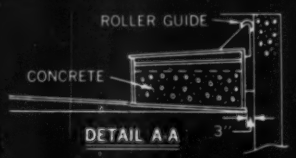

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